Kolhapur Institute of Technology's College of Engineering Kolhapur (Empowered Autonomous)

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

Department of Civil and Environmental Engineering

Curriculum and Syllabus for

Second Year B. Tech. Civil and Environmental Engineering

(As Per NEP, 2020)

Dr. M. M. Yadav
Academic Coordinator &
Dean Examination & Evaluation,
Department of Civil and
Environmental Engineering,
KITCoEK

Dr. A. K. Anand
Head of the Department,
Department of Civil and
Environmental Engineering,
KITCoEK

Dr. A. R. Thorvat
Dean Academics,
Department of Civil and
Environmental Engineering,
KITCoEK

DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

ABOUT THE DEPARTMENT

Kolhapur Institute of Technology's College of Engineering (Autonomous), Kolhapur is the only Institute in Maharashtra offering B. Tech in Civil and Environmental Engineering (04 Years Duration). Department offers M. Tech Program in Environmental Engineering (02 Years Duration) and it also has Ph.D. Research Centre in Environmental Engineering approved by Shivaji University, Kolhapur. Department is Accredited by National Board of Accreditation (NBA), New Delhi. Department of Civil and Environmental Engineering of KIT CoE, Kolhapur has been imparting education and training in all aspects of sustainable environment. The students undergo an academic program based on necessary fundamental concepts and major thrust areas of Civil Engineering and emphasizing on domains of Environmental Engineering such as, Water and Wastewater Engineering, Air and Noise Pollution Control, Solid and Hazardous Waste Management, Hydraulics, Environmental Management System, Environmental Impact Assessment and Legislation, Environment Health and Safety, Environmental Sanitation, Geospatial Technology, Renewable Energy Resources, Environmental Sustainability etc.
Department has PAN India Consultancy. Faculties and students are actively involved in several projects funded by various funding agencies and industries. The department has very good infrastructure equipped with necessary facilities and laboratories. Teaching learning process is effective by use of MOODLE and ICT based education. Student progress is monitored by effective mentoring and feedback system. Department offers B. Tech (Hons.) Civil and Environmental Engineering with Specialization in Green Technology and Sustainability Engineering, Project Based Learning, Business Club Activity, Soft Skill Development Programs, Student – Alumni Dialogues Initiatives as well as Value Added Programs. Department has a very strong alumni base spread all over the world as well as very good industry-institute connect through which training, internship and placement opportunities are provided to the students. The department has very strong student-support system.

DEPARTMENT VISION

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

DEPARTMENT MISSION

M1:	To impart essential technical knowledge, skills and Environmental ethics.
M2:	To develop professional capabilities to meet changing societal and industrial needs.
M3:	To build up base for Research and Consultancy activities.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

PEO1:	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.

DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

PROGRAMME OUTCOMES (PO)	
PO1:	Apply knowledge of mathematics, natural science, computing, engineering fundamentals and engineering specialization for solution of complex problems of Civil and Environmental Engineering.
PO2:	Identify, formulate, review research literature and analyze complex Civil and Environmental Engineering problems reaching substantiated conclusions with consideration for sustainable development.
PO3:	Design creative solutions for complex Civil and Environmental Engineering problems and develop system components to meet identified needs with consideration for public health and safety, whole-life cost, net zero carbon, culture, society and environment as required.
PO4:	Conduct investigations of complex Civil and Environmental Engineering problems using research-based knowledge including design of experiments, modeling, analysis and interpretation of data to provide valid conclusions.
PO5:	Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modeling, recognizing their limitations to solve complex Civil and Environmental Engineering problems
PO6:	Analyze and evaluate societal and environmental aspects while solving complex Civil and Environmental Engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment.
PO7:	Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national and international laws.
PO8:	Function effectively as an individual, and as a member or leader in multi-disciplinary teams.
PO9:	Communicate effectively and inclusively within the engineering community and society at large, through oral presentations and written reports and design documentation, considering cultural, language, and learning differences.
PO10:	Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage Civil and Environmental Engineering projects in multidisciplinary environments.
PO11:	Recognize the need for and have the preparation and ability for independent and life-long learning to engage in contemporary and emerging technologies and thinking in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSO)	
PSO1:	Identify and analyze the pollution related problems generated due to urbanization and industrialization.
PSO2:	Interpret the data using various tools and techniques to provide effective and applicable solutions.

DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

As per NEP Guidelines											
Proposed Scheme of Credit Distribution											
	Year	**FY**		**SY**		**TY**		**B. Tech.**			
Sr. No.	**Curriculum Components**	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**Actual**	**NEP Guidelines**
1	Basic Science Courses **(BSC)**	8	8							**16**	**14-18**
2	Engineering Science courses **(ESC)**	10	3							**13**	**12-16**
3	Programme Core Courses **(PC)**		3	16	15	10	11	11		**66**	**44-56**
4	Programme Elective courses **(PEC)**					3	3	3	6	**15**	**20**
5	Multi Minor **(MM)**			2	3	3	3	3		**14**	**14**
6	Open elective **(OE)**					3	3	2		**8**	**8**
7	Vocational and Skill Enhancement course **(VSEC)**	1	3		1	1				**6**	**8**
8	Ability Enhancement Course **(AEC)**		3				1			**4**	**4**
9	Entrepreneurship /Economics/ Management courses (Mgt/Economics/Mkt/Finance) **(HSSM)**			2		2				**4**	**4**
10	Indian knowledge system **(IKS)**	2								**2**	**2**
11	Value Education course **(VEC)**			2	2					**4**	**4**
12	Research Methodology (Project) **(RM)**							4		**4**	**4**
13	Comm. Engg Project/Field Project (PBL/Seminar/Mini Project) **(CEP)**					1	1			**2**	**2**
14	Project **(PP)**								4	**4**	**4**
15	Internship/OJT (PBL/Seminar/Mini Project/Virtual Internship/Physical) **(OJT)**			1	1				6	**8**	**12**
16	Co-curricular Courses **(CC)**		1		1		1		1	**4**	**4**
		20-22	**20-22**	**20-22**	**20-22**	**20-22**	**20-22**	**20-22**	**20-22**	**174**	
		21	**21**	**23**	**23**	**23**	**23**	**23**	**17**	**174**	

B. Tech. Civil and Environmental Engineering
Regulation 2024-25

SEMESTER-I

Sr. No.	Category	Course Code	Course Name	L	T	P	Hrs. / Week	Credits	Evaluation Scheme			
									Component			
1.	BSC	UHSBS0101	Engineering Mathematics-I	3	1	-	4	4	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
2.	BSC	UHSBS0108	General Physics and Optics	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
3.	ESC	UHSES0109	Engineering Mechanics	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
4.	ESC	UHSES0110	Basic Mechanical Engineering	2	-	-	2	2	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
5.	ESC	UHSES0111	Introduction to Python Programming	2	-	-	2	2	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
6.	BSC	UHSBS0128	General Physics and Optics Lab	-	-	2	2	1	ISE	50	20	
7.	ESC	UHSES0129	Engineering Mechanics Lab	-	-	2	2	1	ISE	50	20	
8.	ESC	UHSES0130	Basic Mechanical Engineering Lab	-	-	2	2	1	ISE	50	20	
9.	ESC	UHSES0131	Introduction to Python programming Lab	-	-	2	2	1	ISE	50	20	
10.	VSEC	UHSVS0132	Workshop Practice Lab	-	-	2	2	1	ISE	50	20	
11.	IKS	UHSIK0136	Ecology, Energy & Environment	2	-	-	2	2	ISE	100	40	
Total:							**26**	**21**	**Total Marks: 800 Total Credit: 21**			

DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

SEMESTER-II

Sr. No.	Category	Course Code	Course Name	L	T	P	Hrs. / Week	Credits	Evaluation Scheme			
									Component			
1.	BSC	UHSBS0201	Engineering Mathematics-II	3	1	-	4	4	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
2.	BSC	UHSBS0212	Applied Chemistry	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
3.	AEC	UHSAE0203	Communication Skills	2	-	-	2	2	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
4.	ESC	UHSES0213	Basic Civil Engineering	2	-	-	2	2	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
5.	PC	UHSPC0214	Fundamentals of Electrical Engineering	2	-	-	2	2	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
6.	BSC	UHSBS0233	Applied Chemistry Lab	-	-	2	2	1	ISE	50	20	
7.	AEC	UHSAE0222	Communication Skills Lab	-	-	2	2	1	ISE	50	20	
8.	ESC	UHSES0234	Basic Civil Engineering Lab	-	-	2	2	1	ISE	50	20	
9.	PC	UHSPC0235	Fundamentals of Electrical Engineering Lab	-	-	2	2	1	ISE	50	20	
10.	VSEC	UHSVS0238	Computer Aided Engineering Drawing	-	-	2	2	3	ISE1 ISE2 ESE (POE)	25 25 50	 20	40
11.	CC	UHSCC0239	Co-Curricular Course	1	-	-	-	1	ISE	100	40	
						Total:	**24**	**21**	**Total Marks: 800** **Total Credit: 21**			

DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

SEMESTER-III

Sr. No.	Category	Course Code	Course Name	L	T	P	Hrs. / Week	Credits	Evaluation Scheme			
									Component			
1.	PC	UCEPC0301	Computational Methods and Numerical Analysis	3	1	-	4	4	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
2.	PC	UCEPC0302	Fluid Mechanics	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
3.	PC	UCEPC0303	Solid Mechanics	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
4.	PC	UCEPC0304	Surveying and Geospatial Technology	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
5.	HSSM	UCEEM0305	Engineering Management	2	-	-	2	2	ESE	50	20	20
6.	VEC	UCEVE0306	Environmental Studies	2	-	-	2	2	ISE	50	20	20
7.	PC	UCEPC0331	Fluid Mechanics Laboratory	-	-	2	2	1	ISE ESE (POE)	25 25	10 10	
8.	PC	UCEPC0332	Strength of Materials Laboratory	-	-	2	2	1	ISE	25	10	
9.	PC	UCEPC0333	Surveying Laboratory	-	-	2	2	1	ISE ESE (POE)	50 25	20 10	
10.	OJT (CLPBL)	UCEIL0334	Building Planning and Design Laboratory	-	-	2	2	1	ISE	50	20	
11.	MM	*UCEMM0__	Multi-Disciplinary Minor	2	-	-	2	2	ESE	100	40	
						Total:	**27**	**23**	**Total Marks: 800** **Total Credit: 23**			

*UCEMM0341	Introduction to Data Science (MM-1)
*UCVMM0341	Basics of Projects and Automation (MM-1)
*UCEMM0342	Introduction to Management (MM-1)

DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

SEMESTER-IV

Sr. No.	Category	Course Code	Course Name	L	T	P	Hrs. / Week	Credits	Evaluation Scheme			
									Component			
1.	PC	UCEPC0401	Building Construction Technology	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
2.	PC	UCEPC0402	Environmental Hydraulics	2	-	-	2	2	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
3.	PC	UCEPC0403	Structural Analysis	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
4.	PC	UCEPC0404	Hydrology and Water Resources Engineering	2	-	-	2	2	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
5.	PC	UCEPC0405	Environmental Chemistry and Microbiology	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
6.	VEC	UCEVE0406	Constitution of India	2	-	-	2	2	ISE	50	20	
7.	PC	UCEPC0431	Material Testing Laboratory	-	-	2	2	1	ISE ESE (OE)	25 25	10 10	
8.	PC	UCEPC0432	Environmental Chemistry and Microbiology Laboratory	-	-	2	2	1	ISE ESE (POE)	25 25	10 10	
9.	OJT (MPBL)	UCEIL0471	Mini Project - I	-	-	2	2	1	ISE	25	10	
10.	VSEC	UCEVS0433	Geospatial Laboratory	-	-	2	2	1	ISE	25	10	
11.	CC	UCECC0434	Co-Curricular Activities I	-	-	2	2	1	ISE	50	20	
12.	MM	*UCEMM0__	Multi-Disciplinary Minor	3	-	-	3	3	ESE	100	40	
						Total:	**28**	**23**	**Total Marks: 850** **Total Credit: 23**			

*UCEMM0441	Statistics for Data Science (MM-II)
*UCVMM0441	Instrumentation and Data Analytics (MM-II)
*UCEMM0442	Introduction to Human Resource management (MM-II)

DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

SEMESTER-V

Sr. No.	Category	Course Code	Course Name	L	T	P	Hrs. / Week	Credits	Evaluation Scheme			
									Component			
1.	PC	UCEPC0501	Water Supply Engineering	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
2.	PC	UCEPC0502	Transportation Engineering	2	-	-	2	2	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
3.	PC	UCEPC0503	Air Pollution and Control	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
4.	PEC	UCEPE05**	Program Elective – I	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
5.	OE	UCEOE05**	Open Elective – I	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
6.	HSSM	UCEEM0504	Sustainability Management	2	-	-	2	2	ESE	50	20	
7.	PC	UCEPC0531	Water Treatment Laboratory	-	-	2	2	1	ISE ESE (POE)	25 25	10 10	
8.	PC	UCEPC0532	Transportation Engineering Laboratory	-	-	2	2	1	ISE	25	10	
9.	VSEC	UCEVS0533	Environmental Monitoring Laboratory	-	-	2	2	1	ISE ESE (OE)	25 25	10 10	
10.	CEP	UCEIL0571	Mini Project – II	-	-	2	2	1	ISE	25	10	
11.	MM	*UCEMM0__	Multi-Disciplinary Minor	3	-	-	3	3	ESE	100	40	
						Total:	**27**	**23**	**Total Marks: 800** **Total Credit: 23**			

*UCEMM0541	Python for Data Science (MM-III)
*UCVMM0541	Applications of AI (MM-III)
*UCEMM0542	Introduction to Marketing Management (MM-III)

Program Electives:

PROGRAM ELECTIVE –I (PEC)								
Sr. No.	**Semester**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Hrs. / Week**	**Credits**
1.	V	UCEPE0511	Environmental Sanitation (PE-I)	3	-	-	3	3
2.	V	UCEPE0512	Renewable Energy Engineering (PE-I)	3	-	-	3	3
3.	V	UCEPE0513	Construction Practices (PE-I)	3	-	-	3	3
						Total:	**3**	**3**

Open Elective Courses:

OPEN ELECTIVE –I (OE)								
Sr. No.	**Semester**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Hrs. / Week**	**Credits**
1.	V	UCEOE0521	Water Resources Management	3	-	-	3	3
						Total:	**3**	**3**

DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

SEMESTER-VI

Sr. No.	Category	Course Code	Course Name	L	T	P	Hrs. / Week	Credits	Evaluation Scheme			
									Component			
1.	PC	UCEPC0601	Wastewater Engineering	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
2.	PC	UCEPC0602	Solid Waste Management	2	-	-	2	2	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
3.	PC	UCEPC0603	Geotechnical Engineering	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
4.	PEC	UCEPE06**	Program Elective – II	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
5.	OE	UCEOE06**	Open Elective – II	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
6.	AEC	UCEAE0604	Business Communication and Value Science		-	2	2	1	ISE	50	20	
7.	PC	UCEPC0631	Wastewater Engineering Laboratory	-	-	2	2	1	ISE ESE (OE)	25 25	10 10	
8.	PC	UCEPC0632	Geotechnical Engineering Laboratory	-	-	2	2	1	ISE ESE (POE)	25 25	10 10	
9.	PC	UCEPC0633	Programming Laboratory	-	-	2	2	1	ISE	25	10	
10.	FP	UCEIL0671	Design and Drawing of Environmental Systems	-	-	2	2	1	ISE	25	10	
11.	CC	UCECC0634	Co-Curricular Activities II	-	-	2	2	1	ISE	50	20	
12.	MM	*UCEMM0__	Multi-Disciplinary Minor	3	-	-	3	3	ESE	100	40	
						Total:	**29**	**23**	**Total Marks: 850** **Total Credit: 23**			

*UCEMM0641	Data Analytics (MM-IV)
*UCVMM0641	Digital Twin and Asset management (MM-IV)
*UCEMM0642	HR practices in the Organization (MM-IV)

DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

PROGRAM ELECTIVE – II (PEC)

Sr. No.	Semester	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1.	VI	UCEPE0611	Noise Pollution and Control (PE-II)	3	1	-	4	4
2.	VI	UCEPE0612	Irrigation and Hydraulic Structures (PE-II)	3	1	-	4	4
3.	VI	UCEPE0613	Design of Steel Structures (PE-II)	3	1	-	4	4
						Total:	**4**	**4**

OPEN ELECTIVE –II (OE)

Sr. No.	Semester	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1.	VI	UCEOE0621	Waste Management	3	-	-	3	3
2.	VI	UCEOE0622	Industrial Health & Safety	3	-	-	3	3
						Total:	**3**	**3**

DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

SEMESTER-VII

Sr. No.	Category	Course Code	Course Name	L	T	P	Hrs. / Week	Credits	Evaluation Scheme			
									Component			
1.	PC	UCEPC0701	Design of Concrete Structures	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
2.	PC	UCEPC0702	Advanced Water and Wastewater Treatment	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
3.	PC	UCEPC0703	Quantity Surveying and Valuation	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
4.	PEC	UCEPE07**	Program Elective – III	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
5.	OE	UCEOE07**	Open Elective – III	2	-	-	2	2	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
6.	PC	UCEPC0731	Treatability Studies Laboratory	-	-	2	2	1	ISE ESE (OE)	25 25	10 10	
7.	PC	UCEPC0732	Quantity Surveying and Valuation Laboratory	-	-	2	2	1	ISE ESE (POE)	25 25	10 10	
8.	RM (Project)	UCEIL0771	Project I	-	-	8	8	4	ISE ESE	50 50	20 20	
9.	MM	*UCEMM0__	Multi-Disciplinary Minor	3	-	-	3	3	ESE	100	40	
						Total:	**29**	**23**	**Total Marks: 800** **Total Credit: 23**			

*UCEMM0741	Mathematical Modelling and Simulation (MM-V)
*UCVMM0741	Automation in Project Implementation (MM-V)
*UCEMM0742	Introduction to Financial Management (MM-V)

DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

PROGRAM ELECTIVE –III (PEC)								
Sr. No.	**Semester**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Hrs. / Week**	**Credits**
1.	VII	UCEPE0711	Environment, Health, and Safety (PE-III)	3	-	-	3	3
2.	VII	UCEPE0712	Operation and Maintenance of Environmental Facilities (PE-III)	3	-	-	3	3
3.	VII	UCEPE0713	Transportation Infrastructure (PE-III)	3	-	-	3	3
						Total:	**3**	**3**

OPEN ELECTIVE-III(OE)								
Sr. No.	**Semester**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Hrs. / Week**	**Credits**
1.	VII	UCEOE0721	Environmental Policies & Laws	2	-	-	2	2
2.	VII	UCEOE0722	Environmental Impact Assessment	2	-	-	2	2
						Total:	**2**	**2**

DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

SEMESTER-VIII

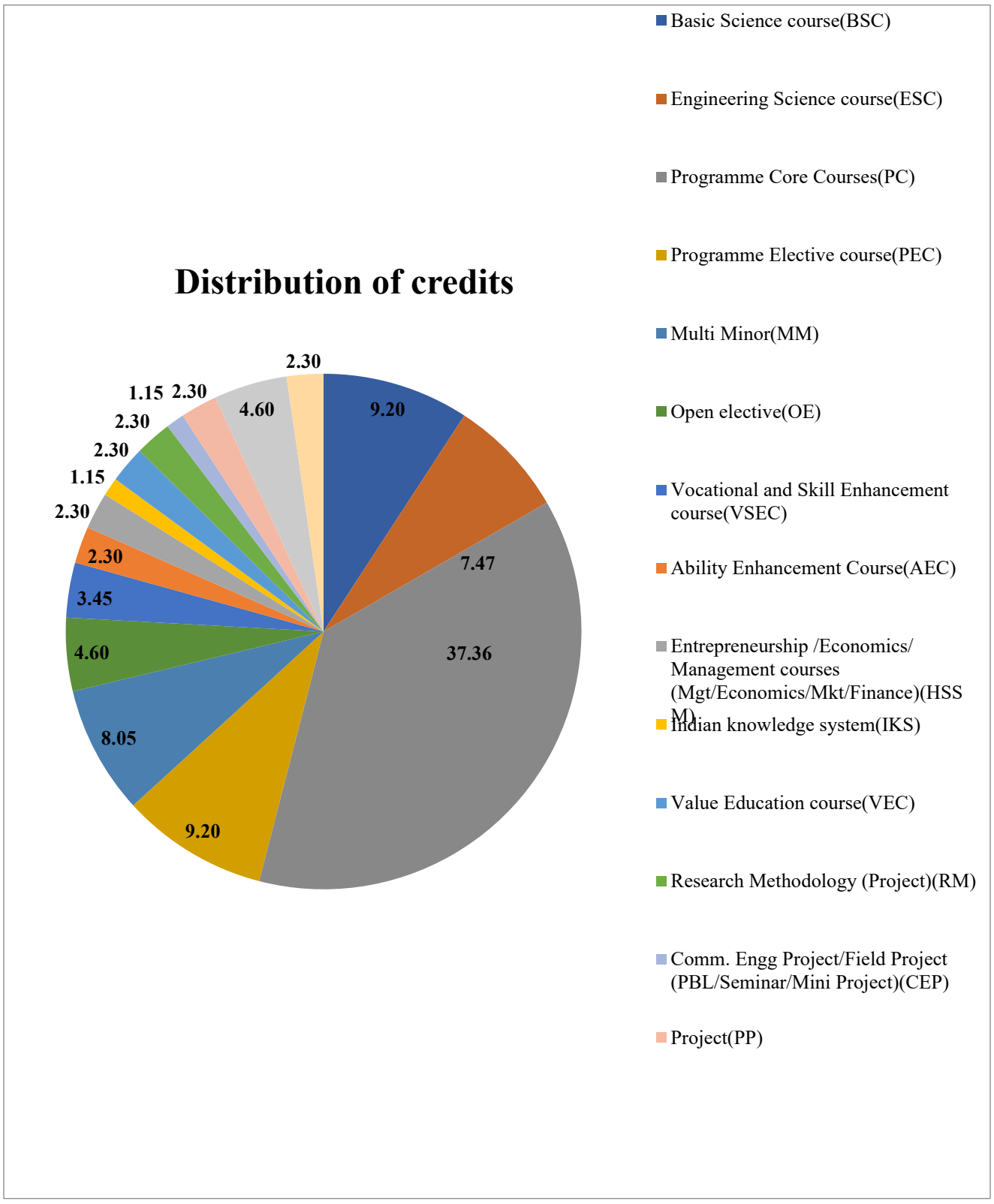
Sr. No.	Category	Course Code	Course Name	L	T	P	Hrs. / Week	Credits	Evaluation Scheme			
									Component			
1.	PEC	UCEPE08**	Program Elective – IV	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
2.	PEC	UCEPE08**	Program Elective – V	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
3.	PP	UCEIL0871	Project II	-	-	8	8	4	ISE ESE	50 50	20 20	40
4.	OJT	UCEIL0872	Internship	-	-	12	12	6	ISE I ISE II	75 75	30 30	60
5.	CC	UCECC0831	Co-Curricular Activities	-	-	2	2	1	ISE	50	20	
						Total:	**28**	**17**	**Total Marks: 500 Total Credit: 17**			

PROGRAM ELECTIVE – IV(PEC)

Sr. No.	Semester	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1.	VIII	UCEPE0811	Advanced Construction Technology (PE-IV)	3	-	-	3	3
2.	VIII	UCEPE0812	Industrial Wastewater Treatment (PE-IV)	3	-	-	3	3
3.	VIII	UCEPE0813	Urban and Rural Planning (PE-IV)	3	-	-	3	3
4.	VIII	UCEPE0814	Environmental Impact Assessment & Legislation (PE-IV)	3	-	-	3	3
						Total:	**3**	**3**

PROGRAM ELECTIVE –V (PEC)

Sr. No.	Semester	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1.	VIII	UCEPE0815	Environmental Management System (PE-V)	3	-	-	3	3
2.	VIII	UCEPE0816	Project Management (PE-IV)	3	-	-	3	3
3.	VIII	UCEPE0817	Environmental Social Governance (PE-V)	3	-	-	3	3
4.	VIII	UCEPE0818	Hazardous Waste Management (PE-V)	3	-	-	3	3
						Total:	**3**	**3**



Pie chart showing the distribution of credits.

DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

MULTIDISCIPLINARY MINOR IN DATA SCIENCE (MDM-DS)								
Sr. No.	**Seme**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Hrs. / Week**	**Credits**
1.	III	UCEMM0341	Introduction to Data Science (MM-I)	2	-	-	2	2
2.	IV	UCEMM0441	Statistics for Data Science (MM-II)	3	-	-	3	3
3.	V	UCEMM0541	Python for Data Science (MM-III)	3	-	-	3	3
4.	VI	UCEMM0641	Data Analytics (MM-VI)	3	-	-	3	3
5.	VII	UCEMM0741	Mathematical Modeling & Simulation (MM-V)	3	-	-	3	3
						Total:	**14**	**14**

MULTIDISCIPLINARY MINOR in PROJECT AUTOMATION (MDM-PE)								
Sr. No.	**Sem**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Hrs. / Week**	**Credits**
1.	III	UCVMM0341	Basics of Projects and Automation (MM-I)	2	-	-	2	2
2.	IV	UCVMM0441	Instrumentation and Data Analytics (MM-II)	3	-	-	3	3
3.	V	UCVMM0541	Applications of AI (MM-III)	3	-	-	3	3
4.	VI	UCVMM0641	Digital Twin and Asset Management (MM-IV)	3	-	-	3	3
5.	VII	UCVMM0741	Automation in Project Implementation (MM-V)	3	-	-	3	3
						Total:	**14**	**14**

MULTIDISCIPLINARY MINOR In LEADERSHIP and MANAGEMENT (MDM-HRD)								
Sr. No.	**Seme**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Hrs. / Week**	**Credits**
1.	III	UCEMM0342	Introduction to Management (MM-I)	2	-	-	2	2
2.	IV	UCEMM0442	Introduction to Human Resource Management (MM-II)	3	-	-	3	3
3.	V	UCEMM0542	Introduction to Marketing Management (MM-III)	3	-	-	3	3
4.	VI	UCEMM0642	HR Practices in the Organization (MM-IV)	3	-	-	3	3
5.	VII	UCEMM0742	Introduction to Financial Management (MM-V)	3	-	-	3	3
						Total:	**14**	**14**

DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

B. TECH (HONS.) IN CIVIL AND ENVIRONMENTAL ENGINEERING WITH SPECIALIZATION IN GREEN TECHNOLOGY AND SUSTAINABILITY ENGINEERING

Sr. No.	Semester	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1.	III	UCEHC0351	Environmentally Sustainable Materials	3	1	-	4	4
2.	IV	UCEHC0451	Energy Technologies and Management	3	1	-	4	4
3.	V	UCEHC0551	Faecal Sludge and Septage Management	3	1	-	4	4
4.	VI	UCEHC0651	Environmental Economics	3	1	-	4	4
5.	VII	UCEHC0751	Mini Project	-	-	4	4	2
						Total:	**20**	**18**

B. TECH (EMERGING MINOR) IN CIVIL AND ENVIRONMENTAL ENGINEERING WITH SPECIALIZATION IN SUSTAINABILITY ENGINEERING

Sr. No.	Semester	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1.	III	UCEMNC0361	Sustainable Materials	3	1	-	4	4
2.	IV	UCEMNC0461	Clean Energy Engineering	3	1	-	4	4
3.	V	UCEMNC0561	Climate Change and Sustainable Development	3	1	-	4	4
4.	VI	UCEMNC0661	Sustainable Infrastructure Engineering	3	1	-	4	4
5.	VII	UCEMNC0761	Environmental Management	2	-	-	2	2
						Total:	**18**	**18**

B. TECH (EXIT COURSES) IN CIVIL AND ENVIRONMENTAL ENGINEERING After semester IV

Sr. No.	Semester	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1.	After IV	UCEEX0491	Advance Construction Technology	3	-	-	3	3
2.	After IV	UCEEX0492	Civil Drafting	1	-	4	5	3
3.	After IV	UCEEX0493	Construction Site Supervision Training	-	-	4	4	2
						Total:		**08**

B. TECH (EXIT COURSES) IN CIVIL AND ENVIRONMENTAL ENGINEERING After semester VI

Sr. No.	Semester	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1.	After VI	UCEEX0691	Estimation & Costing	3	-	-	3	3
2.	After VI	UCEEX0692	Occupational Health & Safety	3	-		3	3
3.	After VI	UCEEX0693	Training	-	-	4	4	2
						Total:		**08**

Title of the Course: Computational Methods and Numerical Analysis Course Code: UCEPC0301	L	T	P	Credits
	3	1	---	4

Course Pre-Requisite: Basic terminologies of differential equations, basic knowledge of probability, differential and integral calculus

Course Description: This course contains linear differential equations and its applications, numerical methods, statistics and probability distributions.

Course Objectives:

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

Course Outcomes:

COs	After the completion of the course the student will be able to	Bloom's Cognitive level	
CO1	Understand various concepts of differential equations, statistical techniques and numerical methods.	II	Understanding
CO2	Solve LDE with constants coefficients and problems on vector differentiation.	III	Applying
CO3	Use numerical methods to interpolate the polynomial for given data, evaluate integrals and obtain solution of differential equations.	III	Applying
CO4	Apply the knowledge of probability distributions to the given data and select the appropriate method for testing of significance.	IV	Analyzing

CO-PO Mapping:

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

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

Assessment Scheme:

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

Assessment Component	Marks
ISE 1	10
MSE	30

ISE 2	10
ESE	50

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

Course Contents:

Unit 1: Linear Differential Equations with Constant Coefficients — 8 **Hrs.**

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 Cauchy's homogeneous equation

Unit 2: Numerical Solution of Differential Equations and Applications of Linear Differential Equations — 7 **Hrs.**

2.1 Numerical solution of second order ordinary differential equations using
(i) Picard's method
(ii) Runge-Kutta fourth order method
(iii) Milne's method
2.2 Applications of Linear Differential Equations to deflection of beams and columns (strut and cantilever problems)

Unit 3: Vector Calculus — 8 **Hrs.**

3.1 Differentiation of vectors
3.2 Velocity and acceleration
3.3 Gradient of scalar point function and Directional derivative
3.4 Divergence of vector point function
3.5 Curl of a vector point function
3.6 Solenoidal and Irrotational vector fields

Unit 4: Probability Distributions — 8 **Hrs.**

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

Unit 5: Test of Significance — 7 **Hrs.**

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

Unit 6: Numerical Techniques — 7 **Hrs.**

6.1 Finite difference: definition and higher order differences.
6.2 Newton's forward interpolation formula.
6.3 Newton's backward interpolation formula
6.4 Newton's divided difference formula for unequal intervals.
6.5 Numerical integration using
  6.5.1 Trapezoidal rule
  6.5.2 Simpson's 1/ 3-rule
  6.5.3 Simpson's 3/8-rule

Textbooks:

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

Reference Books:

SN	Title	Edition	Author/s	Publisher	Year
1.	Advanced Engineering Mathematics	**10**	Erwin Kreyszig	John Wiley & Sons	**2011**
2.	Advanced Engineering Mathematics	**21**	H. K. Dass	S. Chand & Company Pvt. Ltd, New Delhi	**2014**
3.	A text book of Engineering Mathematics		N. P. Bali, Iyengar	Laxmi Publications (P) Ltd., New Delhi	
4.	Engineering Mathematics		Ravish R Singh and Mukul Bhatt	McGraw Hill Education (India) Private Limited, Chennai.	**2017**
5.	Introductory Methods of Numerical Analysis	**05**	S. S. Sastry	PHI Learning Pvt Ltd	**2012**

Class: S. Y .B. Tech Civil and Environmental Engineering **Title of the Course:** Fluid Mechanics **Course No.:** UCEPC0302	**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 analyse problems by making good assumptions and learn systematic engineering methods to solve practical fluid mechanics problems.

Course Learning Objectives:

1. Effectively impart fundamental concepts in fluid mechanics, including mass, energy, and momentum balances.
2. Teach students how to properly analyze and solve fluid mechanics problems analytically.
3. Teach students how to deliberate rational approaches consistent with general laws for correlating parameters of various phenomenon of fluid behavior.
4. Teach students how to infer the physical description and hydraulic illustrations of fluid flow systems.

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	Solve problems to determine pressure forces acting on surfaces, stability conditions, flow systems and losses in pipes using analytical methods.	Cognitive (Applying) L3
CO.3	Identify functional relationships between various parameters in a phenomenon using principles of fluid mechanics.	Cognitive (Applying) L3
CO.4	Analyze the use of basic laws and equations in instrumentation through theoretical and standard laboratory procedures.	Cognitive (Analyzing) L4

CO-PO Mapping:

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

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.
- **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.	08 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' Principle, Metacentre, Metacentric Height, 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: Steady-Unsteady, Uniform-Non-Uniform, Laminar-Turbulent, Rotational-Irrotational, 1-D, 2-D, 3-D Flow, Stream lines, Equipotential lines, Steak Line, Path Line, Stream Tube, Stream Function and Velocity Potential Function, Continuity Equation in 3-D Cartesian Form.	07 Hours
Unit 4: **Fluid Dynamics:** 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.	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).	08 Hours

Text Books:

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

Reference Books:

1. Fluid Mechanics, Frank M. White, McGraw Hill Publishing Company Ltd, New Delhi.
2. Fluid Mechanics, L. Victor, Streeter and E. Benjamin Wylie, Tata McGraw Hill.
3. Fluid Mechanics: Fundamentals and Applications, Yunus, A. Cengel and John M. Cimbala Adapted by S. Bhattacharya, Tata McGraw-Hill Publishing Company Ltd., New Delhi.
4. Introduction to Fluid Mechanics and Fluid Machines, S. K. Som, Gautam Biswas, Suman Chakraborty, Tata McGraw Hill Education Pvt. Ltd., New Delhi.
5. Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill.

Unit Learning Objectives:

To make students to

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

Unit Outcomes:

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. (CO1, CO2, CO3)
2. Compute the pressure forces acting on plane and curved surfaces and Analyze the stability conditions of a floating body. (CO2, CO3, CO4)
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. (CO1, CO2, CO3)
4. Derive Euler's Equation of motion and Deduce Bernoulli's equation to solve problems on dynamics of fluid flow system. (CO2, CO3, CO4)
5. Compare laminar and turbulent flow characteristics and Explain the boundary layer concept. (CO1, CO4)
6. Interpret different pipe fittings and Evaluate the fluid velocity considering major and minor losses. (CO2, CO3, CO4)

Class: S.Y.B.Tech Civil and Environmental Engineering **Title of the Course:** Solid Mechanics **Course Code:** UCEPC0303	**L**	**T**	**P**	**Credits**
	03 hours per week	---	---	03

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:

1. Study the basic behavior of material when subjected to loading.
2. Understand various patterns of loading on structural members and corresponding resistivemechanisms of structural members.
3. Study the various straining actions and its effect when present individually on a member.
4. 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**
CO1	Explain Properties and behavior of different materials when subjected to loading	L2 Understanding
CO2	Identify various forms of loads and effects on structural members.	L3 Applying
CO3	Examine properties and behavior of materials by experimental analysis	L4 Analyzing
CO4	Analyze structural members subjected to various load conditions.	L4 Analyzing

CO-PO Mapping:

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

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

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/GroupDiscussions 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 Hrs.
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.	07 Hrs.
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. **Shear 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 andcomposite shapes.	08 Hrs.
Unit 4: Thin Cylinders and Strain EnergyThin 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, PowerTransmitted through Shaft, Comparison of shafts.	07 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 Environmental Engineering **Title of the Course:** Surveying and Geospatial Technology **Course No.:** UCEPC0304	**L**	**T**	**P**	**Credit**
	03 hours per week	-	-	3

Course Pre-Requisite:

Students shall have the knowledge of:

- Basic Civil Engineering
- Engineering Physics

Course Description:

The course will help the students to understand the importance of the Surveying, Levelling 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. and also impart knowledge on advanced surveying, photogrammetric survey, remote sensing, and Geographic Information Systems (GIS).

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 instrument.
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 Cognitive Descriptor**
CO.1	Understand to evaluate alternate surveying techniques suitable for scope of the project and site situation.	Understanding (L2)
CO.2	Identify Surveying equipment, work in team, collect and analyse the topographical data with due consideration to systematic errors, random errors, and blunders.	Identifying (L3)
CO.3	Make use of their knowledge and select appropriate process of remote sensing, GIS in surveying.	Applying (L3)
CO.4	Utilize their knowledge of GPS and RS technology in surveying process.	Applying (L3)

CO-PO Mapping:

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

COs	**PSO1**	**PSO2**
CO.1		3
CO.2	3	3
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 and Basics of Surveying, Levelling **(A)**Basic Principle of Surveying, Types of surveying, Classification of Survey based on Instrument, Scale, purpose and place, Errors in Surveying, applications of Surveying. **(B)**Introduction of Leveling, Study and use of various levels Dumpy level, Auto level, field procedure in leveling, types of leveling, source and errors in levelling, Temporary and Permanent adjustment of dumpy level, various corrections used in leveling	**08 Hrs.**
Unit 2: Contouring and Computations of Areas and Volumes **(A)** Contours: Contour intervals, characteristics of contours, methods of contouring, Interpolation of contours, drawing contours, uses of contour maps. **(B)** Area- Trapezoidal, Simpson's rule, mechanical and digital planimeter, Volume – Trapezoidal and Prismoidal rule for Earthwork	**07 Hrs.**
Unit 3: Theodolite & Tacheometry Surveying **(A)**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 survey, Use of Theodolite for various works such as prolongation of a straight line, setting out an angle etc. **(B)**Tacheometry: Principle, Uses of tacheometry, Instruments used in tacheometry, Determination of tacheometric constants, Systems of tacheometric surveying - stadia system fixed hair method, Errors.	**08 Hrs.**
Unit 4: Curves & Hydrographic Surveying **(A)**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 by offset method. **(B)** Introduction, Purpose of hydrographic survey, Methods of hydrographic survey, mean sea-level, tide gauges, location of soundings, equipment's for taking soundings	**07 Hrs**
Unit 5: Introduction to Geographical Information Systems (GIS) Overview of GIS, Definitions, Components, Applications GIS Data, Models Projections and Coordinate Systems, Digitizing, Attribute Data, Spatial Data, Spatial Analysis, Implementation Issues and the Future of GIS, Introduction to any GIS Software.	**07 Hrs**
Unit 6: Global Positioning System (GPS), DGPS and Remote Sensing (RS) (A)GPS: Definition, Principles, Types, Satellite Positioning; Differential GPS; Kinematic, GPS; Accuracy of Differential GPS; Applications in Land, Water and Air, Surveys by GPS Exercises. (B) Definition, Physics of Remote Sensing, Electromagnetic Radiation and its Interactions With atmosphere, Platforms and Sensors, Aerial Photographs, Active and Passive Sensors, Data Products, Various Satellites in Orbit, and their sensors, Drone Technological Survey	**08 Hrs**

Textbooks:

1. A Textbook of Advanced Surveying by R. Agor
2. Surveying and Leveling by Basak – Second Edition
3. N. N. Basak, Surveying and Leveling, Tata McGraw Hill Publications, 1st Edition.
4. B. C. Punmia, Surveying and Leveling, Vol I & II, Laxmi Publications.
5. S. K. Duggal, Surveying Vol. I and II, Tata McGraw Hill, New Delhi.

References:

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

Class: T.Y. B. Tech Civil & Environmental Engineering **Title of the Course:** Engineering Management **Course No.:** UCEEM0305	**L**	**T**	**P**	**Credit**
	02 hours per week	-	-	2

Course Pre-Requisite: Students must have knowledge of

- Basic Civil Engineering
- Engineering Mathematics

Course Description:

Students will learn basic principles of management, including their components. Understand the importance of scheduling along with their practical applications. Will able to identify critical activities from various activities also it will enhance the skill of students in material management & decision making.

Course Learning Objectives:

1. To explain managerial & leadership roles in engineering projects.
2. To discuss the fundamentals of material management & importance of engineering economics in projects.
3. To discuss fundamentals of project planning & decision making.
4. To elaborate the factors affecting legal aspects of engineering projects.

Course Outcomes:

COs	**After the completion of the course the students will be able to**	**Bloom's Cognitive Descriptor**
CO.1	Understand the nature, process, and importance of management in engineering project.	Cognitive (Understanding) L2
CO.2	Apply EOQ and ABC analysis techniques in material management.	Cognitive (Apply) L3
CO.3	Identify the critical path in a project.	Cognitive (Apply) L3
CO.4	Compute project duration and slack time using PERT.	Cognitive (Apply) L3

CO-PO Mapping:

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

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

Assessments :

Assessment	Weightage (Marks)
ESE	50

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

Course Contents:

Unit 1: **Principles of Management** (by Henry Fayol). Functions of Management: a) Planning – Nature, Process and Importance of Planning, b) Organizing – Types, Organization Charts, Site Layout, c) Staffing –Introduction, d) Directing, Co-Ordination, Communication, Motivation and Controlling. e)Decision Making: Process, decision Tree (Concept Only)	**08 Hrs.**
Unit 2: **Material Management –** Purchasing Principles, Stores: Coding System, Function, Responsibilities, Record and Accounting, Inventory Control–An Introduction, Inventory Cost, EOQ Analysis, ABC Analysis, Safety Stocks.	**07 Hrs.**
Unit 3: **Project Management:** Introduction, steps in Project Management– Work Break Down Structure. Project Planning - Bar Chart, Mile Stone Chart, Development, Critical Path Method (CPM): Introduction, Time Estimates, Floats, Critical Path. Crashing of Network	**08 Hrs.**
Unit 4: **Performance Evaluation and Review Techniques (PERT)-** Concept of Probability, Normal and Beta Distribution, Time Estimates and Calculations of Project Duration, Slack, Probability of Project Completion, Precedence Network concept.	**07 Hrs.**

Textbooks:

1. Engineering Management–Stoner
2. Principles of Management–Davar
3. A Text book of Management– A. S. Deshpande

References:

1. Operation Research–S. H. Deshpande
2. Operation Research– Wagner Wikey Easter Ltd., New Delhi

Unit wise Measurable Students Learning Outcomes:

Unit Learning Objectives:

1. To understand the nature, process, and importance of planning in management
2. To identify different types of organizing and interpret organization charts and site layouts.
3. To understand purchasing principles and their application in material management.
4. To determine appropriate safety stock levels for efficient inventory management.
5. To understand project management principles and the steps in creating a Work Breakdown Structure.
6. To understand and apply techniques for crashing project networks.
7. To learn probability concepts and distributions (Normal and Beta) in PERT
8. To determine the probability of project completion within a given timeframe.

Class: S.Y. B. Tech Civil and Environmental Engineering **Title of the Course:** Audit Course – I: Environmental Studies **Course Code: UCEVE0306**	**L**	**T**	**P**	**Credits**
	2	**-**	**-**	**2**

Course Pre-Requisite: Students shall have knowledge of:

- Basic Science (Physics and Chemistry)

Course Description: The objective of the course is imparting fundamental knowledge and awareness of Environmental Studies 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 to the environment, environmental ethics and human rights towards the environment.
4. Study various laws and regulations related to environment and its applicability in society and industries

Course Outcomes:

COs	After the completion of the course the student will be able to	Bloom's Cognitive	
		Level	Descriptor
CO1	Summarize natural resources, importance of ecosystem and conservation of biodiversity with respect to multiple disciplines.	2	Understanding
CO2	Explain causes, effects, solutions for various pollution problems and its minimization strategies.	2	Understanding
CO3	Interpret environmental ethics and their implementation for betterment of environment and human life.	2	Understanding
CO4	Outline the requirements of laws and regulations for environmental conservation and applicability of legislations in society and industries.	2	Understanding

CO-PO Mapping:

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

CO	**PSO1**	**PSO2**
CO1		
CO2	1	1
CO3		1
CO4		1

Assessment Scheme: ISE: Assessment is based on Assignment/Declared Test/Quiz/Seminar/Group Discussions etc.

Assessment Component	**Marks**
ISE	50

Course Contents:

Unit 1: Nature of Environmental Studies Definition, scope and importance, Multidisciplinary nature of environmental studies, Need for public awareness.	4 **Hrs.**
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, dam's benefits and problems. c) Mineral resources: Usage and exploitation. Environmental effects of extracting and using mineral resources. d) Food resources: World food problem, changes caused by 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.	5 **Hrs.**
Unit 3: Ecosystems Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers. Energy flows 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 **Hrs.**
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 **Hrs.**
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 **Hrs.**
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 **Hrs.**
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.	5 **Hrs.**

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 the environment.

UO 7: Discuss laws and regulations for conservation of environment.

Class: S. Y. B. Tech Civil and Environmental Engineering **Title of the Course:** Fluid Mechanics Laboratory **Course No.:** UCEPC0331	**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. Introduce students to a wide variety of fluid measurement systems and devices.
2. Teach students how to perform the experiments to verify fundamental principles and calibrate measuring devices.

Course Outcomes:

COs	**After the completion of the course the students will be able to**	**Bloom's Taxonomy Descriptor**
CO.1	Demonstrate basic principles and equations of fluid mechanics through experimentation.	Cognitive (Understanding) L2
CO.2	Examine 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**
CO.1				3	2				2	2	
CO.2				3	2				2	2	

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

Assessments:

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

- **ISE:** Based on practical performed/ Quiz/ Mini-Project assigned/ Presentation/ Group Discussion/ Internal oral etc.
- **ESE (POE):** Assessment is based on practical 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. (CO1)	2 Hours
Experiment No. 2: Pressure Measuring Devices. • **Learning Outcome:** To develop the ability to select and use appropriate device for pressure measurement. (CO1)	2 Hours

Experiment No. 3: Stability of Floating Objects. • **Learning Outcome:** To calculate metacentric height of a given ship model to check the stability condition. (CO1)	2 Hours
Experiment No. 4: 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. (CO1)	4 Hours
Experiment No. 5: Calibration of Venturimeter. • **Learning Outcome:** To determine the coefficients of discharge for given venturimeter using analytical and graphical methods. (CO2)	4 Hours
Experiment No. 6: Calibration of Orificemeter. • **Learning Outcome:** To determine the coefficients of discharge for given orificemeter using analytical and graphical methods. (CO2)	4 Hours
Experiment No. 7: Calibration of Orifice. • **Learning Outcome:** To evaluate the hydraulic coefficients (C_d, C_v, C_c and C_R) of orifice and their interrelationships. (CO2)	4 Hours
Experiment No. 8: Pipe Friction Experiment. • **Learning Outcome:** To determine the Darcy's Coefficient (Friction Factor) for different pipe materials. (CO2)	4 Hours
Experiment No. 9: 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. (CO1)	2 Hours
Experiment No. 10: 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. (CO1)	2 Hours

Text Books:

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

Reference Books:

1. Fluid Mechanics, Frank M. White, McGraw Hill Publishing Company Ltd, New Delhi.
2. Fluid Mechanics, L. Victor, Streeter and E. Benjamin Wylie, Tata McGraw Hill.
3. Fluid Mechanics: Fundamentals and Applications, Yunus, A. Cengel and John M. Cimbala Adapted by S. Bhattacharya, Tata McGraw-Hill Publishing Company Ltd., New Delhi.
4. Introduction to Fluid Mechanics and Fluid Machines, S. K. Som, Gautam Biswas, Suman Chakraborty, Tata McGraw Hill Education Pvt. Ltd., New Delhi.
5. Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill.

Class: S. Y. B. Tech Civil and Environmental Engineering **Title of the Course:** Strength of Materials Laboratory **Course No.:** UCEPC0332	**L**	**T**	**P**	**Credit**
	---	**---**	**02 hours per week**	**1**

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**
CO1	Demonstrate the properties of materials under action of various loads.	**L2 Understanding**
CO2	Test for the behavior of various structural materials in terms of stress and strain and energy	**L4 Analyzing**

CO-PO Mapping:

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

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

Assessments :

Assessment	**Weightage (Marks)**
ISE	25

• **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 ofUniversal Testing Machine.	4 Hours
Experiment No. 2: Tensile test on Mild steel and TMT steel. **Learning Outcome:** To determine tensile strength, percentage of elongation andother mechanical properties of Mild steel.	4 Hours
Experiment No. 3: Compression test on M.S. and C.I, cement bricks or pavingblocks. **Learning Outcome:** Determine crushing strength of different materials.	4 Hours
Experiment No. 4: Compression test on timber. **Learning Outcome:** To determine compressive strength of timber.	4 Hours
Experiment No. 5: Direct shear test on Metals **Learning Outcome:** To determine shear strength of metals.	4 Hours
Experiment No. 6: Charpy or Izod Impact test on different metals. **Learning Outcome:** Find out energy absorption by Charpy and Izod impact teston metal specimen.	4 Hours
Experiment No. 7: Torsion test on different metals. **Learning Outcome:** Find out effect of torsional force by torsion test on metalspecimen.	4 Hours
Experiment No. 8: Bending test on timber. **Learning Outcome:** To determine bending strength of timber	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., CharotarPublication.
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:** Surveying Laboratory **Course No.:** UCEPC0333	**L**	**T**	**P**	**Credits**
	---	**---**	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 practical.

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 equipment's/instruments.	Cognitive (Understanding) L2
CO.2	Apply equipment's /instruments for conducting surveying, levelling, theodolite traversing for civil works.	Cognitive (Applying) L3

CO-PO Mapping:

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

COs	**PSO1**	**PSO2**
CO1		2
CO2		3

Assessments:

Assessment	**Weightage (Marks)**
ISE	50
ESE (POE)	25

- **ISE:** Based on practical performed/ Quiz/ Mini-Project assigned/ Presentation/ Group Discussion/ Internal oral etc.
- **ESE (POE):** Assessment is based on practical 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 levelling procedure and operation of auto level.	2 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: Direct Method a) Measurement of Horizontal Angle by direct 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 Horizontal Angle Measurement by using theodolite: Repetition Method a) Measurement of Horizontal Angle by repetition method **Learning Outcome:** To apply theodolite for field work surveying	2 Hours
Experiment No. 5: Exercise based on Horizontal Angle Measurement by using theodolite: Reiteration Method a) Measurement of Horizontal Angle by reiteration method **Learning Outcome:** To apply theodolite for field work surveying	2 Hours
Experiment No. 6: 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	2 Hours
Experiment No. 7: 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.	2 Hours
Experiment No. 8: 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.	4 Hours
Experiment No. 9: Introduction to advanced instruments. a) Study of GPS b) Study of DGPS **Learning Outcome:** To explain various components and application of GPS and Total station.	4 Hours
Experiment No. 10: Introduction to drone surveying. a) Study of various parts of Drone. b) Surveying by using drone. **Learning Outcome:** To explain various components and application of drone.	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
Textbooks: 1. A Textbook 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	

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

Class: S. Y. B. Tech Civil & Environmental Engineering **Title of the Course:** Building Planning and Design Laboratory **Course No.:** UCEIL0334	**L**	**T**	**P**	**Credit**
	---	---	02 hours per week	1

Course Pre-Requisite:

- Basic civil engineering
- 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 Objectives:

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

Course Learning Outcomes:

COs	**After the completion of the course the students will be able to**	**Bloom's Cognitive Descriptor**
CO.1	Plan components of building	(Applying) L3
CO.2	Design and compile Residential and public building drawings using AutoCAD	(Create) L6

CO-PO Mapping:

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

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

Assessments:

Assessment	**Weightage (Marks)**
ISE	50

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

Course Contents:

Drawing No. 1: Door & Window drawings **Learning Outcome:** Detail drawing of door& window showing all components of door & window (Section & Elevation)	4 Hours
Drawing No. 2: Design and drawing of Staircase: **Learning Outcome:** Detail design and drawing of Dog legged & Open well Staircase	4 Hours
Drawing No. 2: Line plan of Residential & Public building: **Learning Outcome:** Detail line plan residential and public building	8 Hours
Drawing No. 4: Drawing of Measurement plan of any residential or public building **Learning Outcome:** Draw measurement plan for building.	6 Hours
Drawing No. 5: Building drawing	8 Hours

Detailed Design &drawing for G+1 residential building or Public building using AutoCAD. Providing following details • Submission Plan • Foundation / Centre Line Drawing. • Furniture layout plan. • Electrification plan • Water supply and drainage plan. **Learning Outcome:** Design and draw detailed submission plan along with working drawing foe same	
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.	
References: 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 & Environmental Engineering **Title of the Course:** Introduction to Data Science **Course Code:** UCEMM0341	**L**	**T**	**P**	**Credit**
	2	-	-	2

Course Pre-Requisite:

Students shall have the knowledge of:

- Python
- Ms-Office

Course Description:

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

Course Learning Objectives:

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

Course Outcomes:

COs	**After the completion of the course the students will be able to**	**Bloom's Cognitive Descriptor**
CO.1	Understand the purpose of Data Science.	Understanding (L2)
CO.2	Interpret the conclusions based on data analytics.	Understanding (L2)
CO.3	Summarize the methods of data extraction	Understanding (L2)
CO.4	Identify the impact and potential of data science in solving real-world problems.	Apply (L3)

CO-PO Mapping:

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

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

Assessments :

Assessment	**Weightage (Marks)**
ESE	100

ESE: Assessment is based on 100% course content

Course Contents:

Unit 1: **Introduction**: Introduction to Data Science, Different Sectors using Data science, Purpose and Components of Data Science. Data collection from different sources	**07 Hrs.**
Unit 2: **Data Analytics**	**07 Hrs.**

Data Analytics Process, Knowledge Check, Exploratory Data Analysis (EDA), EDA Quantitative technique, EDA- Graphical Technique, Data Analytics Conclusion and Predictions	
Unit 3: **Data Extraction** Feature Generation and Feature Selection (Extracting Meaning from Data)- Motivating application: user (customer) retention- Feature Generation (brainstorming, role of domain expertise, and place for imagination)- Feature Selection algorithm	**07 Hrs.**
Unit 4: **Data Visualization:** Basic principles, ideas and tools for data visualization, Examples of inspiring (industry) projects- Exercise: create your own visualization of a complex dataset. Applications of Data Science, Data Science and Ethical Issues- Discussions on privacy, security, ethics- A look back at Data Science- Next-generation data scientists. Applications in environmental engineering	**09 Hrs.**

Textbooks:

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

References:

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

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

Course Pre-Requisite:

Basic Civil Engineering

Course Description:

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

Course Learning Objectives:

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

Course Outcomes:

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

CO-PO Mapping:

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

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

Assessments:

Teacher Assessment:

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

Assessment	Marks
ESE	100

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

Course Contents:

Unit: 1	**CO: 1**	

Project Basics:

Definition, Characteristics, Parameters affecting Project, lifecycle Phases of Project, Project Stakeholders, Resources, Scope & Responsibility matrix

Hrs. 06

Unit: 2	**CO: 1**	

Project Components and its Workflow

Types of Projects, Work breakdown structure of Project, , Introduction to project cost , Value stream, Project sustainability, Financial statements (balance sheet, Cash flow) in Projects

Hrs. 10

Unit: 3	**CO: 2**	

Need for Automation

SWAT analysis for a project, Activity-Resource allocations analysis, Value stream mapping, Productivity measurement, Reason for automation, Impact of automation

Hrs. 08

Unit: 4	**CO: 2**	

Automation strategies

Technology strategy, Competitive strategy, scope of strategy, dept of technology, organizational fit,

Introduction to digitization, IoT, Integrate systems, BIM, Prefab, robotics, AI

Hrs. 06

and ML, Hyperutomation	

References Books:

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

Unit wise Measurable students Learning Outcomes:

ULO	After the completion of the course the student should be able to
ULO1	Understand project basic definition, scope and characteristics
ULO2	Identify Project components and their workflow along with costing
ULO3	Identify need for process automation
ULO4	Define Automation strategy

Class: S. Y. B. Tech Civil & Environmental Engineering **Title of the Course:** Introduction to management **Course Code: UCEMM0342**	**L**	**T**	**P**	**Credit**
	2	-	-	2

Course Pre-Requisite:

Students shall have the knowledge of:

- Basics of Communication Skills

Course Description:

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

Course Learning Objectives:

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

Course Outcomes:

COs	**After the completion of the course the students will be able to**	**Bloom's Cognitive Descriptor**
CO.1	Understand the concept, nature, and importance of management functions	Understanding (L2)
CO.2	Outline the importance and process of decision-making	Understanding (L2)
CO.3	Illustrate the definition, importance, and scope of Organizational Behavior (OB) and its fundamental concepts	Understanding (L2)
CO.4	Explain motivation theories like Maslow's hierarchy and Herzberg's theory	Understanding (L2)

CO-PO Mapping:

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

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

Assessments :

Assessment	**Weightage (Marks)**
ESE	100

ESE: Assessment is based on 100% course content

Course Contents:

Unit 1:

Introduction: Basic concepts of management- Definition, Need and Scope Different schools of management thought- Behavioral, Scientific, Systems, and Contingency Contribution of Management Thinkers- Taylor, Fayol, Elton Mayo Functions of Management – Concept, Nature, Importance, Steps and Limitations.	**07 Hrs.**
Unit 2: **Leadership:** Concept, Nature, Importance, Attributes of a leader, developing leaders across the organization, Leadership Grid. Decision making: Concept, Nature, Importance, and Process. Types of decisions. Problems in decision making.	**07 Hrs.**
Unit 3: **Introduction to Organizational Behaviour**: Definition, Importance, Scope, Fundamental Concepts of OB, Different models of OB - autocratic, custodial, supportive, collegial and SOBC Personality & Attitudes: Meaning of personality, attitude - Development of personality – Attributes of personality- Transactional Analysis – Ego states – Johari window - Nature and dimensions of attitude – Developing the right attitude	**07 Hrs.**
Unit 4: **Motivation:** Definition, Importance, Motives, Characteristics Classification of motives - Primary & Secondary motives. Theories of Motivation - Maslow's Theory of need hierarchy - Herzberg's theory. Morale - Definition and relationship with productivity - Morale Indicators. Group Dynamics and Team building: Concept of Group & Team. Theories of Group Formation - Formal and Informal Groups. Importance of Team building. Stress management: Definition, Causes, Managing stress, Stress as a motivator. Work life balance	**09 Hrs.**
Textbooks: 1. Organizational Behaviour, 9th Ed. - Stephen Robbins 2. Essentials of Management – Koontz – TMGH – 3. Principles & Practices of Management – Saxena 4. Management Concepts & Practices – Hannagan	
References: 1. Kotter, J. P. (1999). "What Effective General Managers Really Do," Harvard Business Review, March–April 1999, pp. 145–159., 5. Hannaway, J. (1989). Managers Managing: The Workings of an Administrative System. New York: Oxford University Press, P. 39., 2. Eccles, R. G. & Nohria, N. (1992). Beyond the Hype: Rediscovering the Essence of Management. Boston: The Harvard Business School Press, p. 47.	

Class: S. Y. B. Tech Civil & Environmental Engineering **Title of the Course:** Building Construction Technology **Course Code:** UCEPC0401	**L**	**T**	**P**	**Credit**
	03	-	-	3

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 and building services
- The course includes details of concrete technology
- The course also deals with various application construction materials

Course Learning Objectives:

- Aware the student with a wide range of building materials, their properties and its use in architectural design and construction.
- Aware the student about various building services.
- Aware the student about methods of construction and quality required for concrete works.
- To develop a practical approach in choosing architectural and construction materials based on use, desired results, durability, availability and cost.

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.	Remember (L1)
CO.2	Understand the importance of building services.	Understanding (L2)
CO.3	Examine various factors affecting quality of fresh and hardened concrete	Analyzing (L4)
CO.4	Design concrete mix as per the field requirement using various codes	Creating (L6)

CO-PO Mapping:

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

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

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**: Importance of building materials. Stone masonry – principal terms & its types 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 Material in masonry Timber – Natural & Artificial wood and their application in Civil Engineering	**08 Hrs.**
Unit 2: **Roof and flooring materials** Roof: Introduction, types of roof-pitched roof and its types, single roof, lean-to roof, couple roof, collar beam roof, purlin roof, double purlin roof and frame or trussed roof Roofing materials: terminology regarding roofing, different types of roofing materials Roof construction – types and their suitability, Ground and Upper floors and factors for selections of floorings: Various types of Tile flooring (Natural and Artificial Material)	**07 Hrs.**
Unit 3: **Building Services:** Plumbing & Drainage Systems Electrification systems comfort and convenience, damp prevention, water-proofing techniques, heat insulation, day lighting & ventilation. Sound insulation and anti termite treatment Formwork: Ideal Requirements & types.	**07 Hrs.**
Unit 4: **Ingredients of Concrete** Cement:-Manufacture of Portland cement, Chemical composition, Hydration of cement, Classification and types of cement, Tests on cement. Aggregate :-Classification, Mechanical and Physical properties, Deleterious Materials, Soundness, Alkali aggregate reaction, Grading of Aggregates, Tests on aggregate, Artificial and Recycled aggregate. Admixtures in Concrete: types and its function	**09 Hrs.**
Unit 5: **Fresh Concrete** 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 Concrete mix design Factors to be considered, Statistical quality control, Methods of Mix Design IS(10262), and DOE, High strength concrete, Acceptance criteria for concrete as per IS specifications.	**08 Hrs.**

Unit 6:	**06 Hrs.**
Special Concretes Special Concretes: Light weight concrete, Polymer concrete, Fibre reinforced concrete, High performance concrete, Pumped concrete, Ready mixed concrete, Roller compacted concrete, Ferro- cement.	

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

References:

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
7. Jain V.K. “Fire safety in Buildings” new Age International Publisher
8. Barrid, “Building Construction” Tata McGraw Hill, New Delhi
9. Ghosh,”Materials of Construction” Tata McGraw Hill
10. CBRI, Roorkee , “Building Construction manual ‘.
11. TTTI Chandigrah, “Civil Engineering Materials”, Tata McGraw Publication
12. Callender,” Times Savers Standards of Architectural Design Data”, Tata McGraw Hill

Unit wise Measurable Students Learning Outcomes:

Unit wise Measurable students Learning Outcomes:

At the end of course students will

ULO 1.1: Understand the properties of masonry materials.

ULO 1.2: Know the various types of bonds in brick masonary.

ULO 2.1: Understand the details of roff structure

ULO 2.2: Learn various types of flooring materials

ULO 3.1: Understand Plumbing & electrification systems

ULO 3.2: understand various types formwork.

ULO 4.1: Understand ingredients of concrete.

ULO 5.1: Understand the significance of different tests carried on concrete

ULO 5.2: Understand the concrete mix design

ULO 6: 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 various types of roofs as per suitability.

UO 2.2: Select appropriate type of flooring material.

UO 3.1 Decide the various systems for building

UO 3.2: Select the appropriate formwork for building construction.

UO 4.1: Explain various ingredients of concrete & 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:** Environmental Hydraulics **Course No.:** UCEPC0402	**L**	**T**	**P**	**Credits**
	02 hours per week	---	---	02

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. Effectively impart fundamental concepts in hydraulics to recognize the physical description and hydraulic illustrations of open channel flow systems.
2. Teach students how to properly analyze and solve hydraulics problems either analytically and numerically.
3. Teach students how to appraise the underlying principles and concepts behind a specific phenomenon for correlating various parameters.
4. Teach students how to describe the various components and design parameters of open channels, water distribution systems and sewerage systems.

Course Outcomes:

COs	**After the completion of the course the students will be able to**	**Bloom's Cognitive Descriptor**
CO.1	Explain the fundamental concepts used in the analysis and design of hydraulic systems.	Cognitive (Understanding) L2
CO.2	Solve problems to optimize hydraulic systems related to open channels, flow measurements, water distribution and sewerage systems through selection and use of appropriate methods.	Cognitive (Applying) L3
CO.3	Identify functional relationships between various parameters in a phenomenon using principles of hydraulics.	Cognitive (Applying) L3
CO.4	Analyze the hydraulic aspects and design criteria of overall water distribution and sewerage systems.	Cognitive (Analyzing) L4

CO-PO Mapping:

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

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: **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.	08 Hours
Unit 2: **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.	07 Hours
Unit 3: **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.	08 Hours
Unit 4: **Sewerage System:** Types of Sewer Systems, Types of Sewerage System: Combined, Separate and Partially Separate System, Patterns of Collection Systems: 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.	07 Hours

Textbooks:

1. A Textbook of Fluid Mechanics and Hydraulic Machines, Dr. R. K. Bansal, Laxmi Publications, New Delhi, 2013.
2. Environmental Engineering – 1, Water Supply Engineering, B. C. Punmia, Arun K. Jain and Ashok K. Jain, Laxmi Publications Pvt. Ltd., New Delhi.

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

Reference Books:

1. Flow in Open Channels, K. Subramanya, McGraw Hill Education India Pvt. Ltd., New Delhi.
2. Flow Through Open Channels, K.G. Ranga Raju, Tata McGraw Hill.
3. Fluid Mechanics and Machinery, C. P. Kothandaraman and R. Rudramoorthy, New Age International Publishers.
4. Fluid Mechanics, Frank.M. White, McGraw Hill Publishing Company Ltd, New Delhi.
5. Fundamentals of Hydraulic Engineering Systems, R. J. Houghtalen, A. Osman Akan, and Ned H. C. Hwang, Prentice Hall, Boston.
6. Introduction to Fluid Mechanics and Fluid Machines, S. K. Som, Gautam Biswas, Suman Chakraborty, Tata McGraw Hill Education Pvt. Ltd., New Delhi.
7. Open Channel Flow, M. Hanif Chaudhry, Pentice Hall, Boston.
8. Open Channel Hydraulics, V. T. Chow, Tata McGraw Hill.

Unit Learning Objectives:

Make students to

1. Understand the uniform flow through open channel and depth energy relationships.
2. Recognize the methods for measurement of flow through open channels.
3. Study the water distribution system, layout and types of networks.
4. Learn basic principles of hydraulics, laws and equations for the analysis and design of sewerage system.

Unit Outcomes:

After completion of the unit, 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. (CO1, CO2, CO3)
2. Differentiate between notches and weirs and Solve problems on flow measurement through open channel using theoretical and standard laboratory procedures. (CO1, CO2, CO3)
3. Explain methods of water distribution, layout and types of networks and Solve problems on water distribution networks. (CO1, CO4)
4. Apply basic hydraulics principles, laws and equations and appropriate methods in the analysis and design of sewerage system. (CO1, CO4)

Class: S. Y. B. Tech Civil and Environmental Engineering Title of the Course: Structural Analysis Course No.: UCEPC0403	L	T	P	Credits
	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:

1. To evaluate combined effect of direct and bending stresses.
2. To study effect of Two Dimensional stresses and principal stresses and strains.
3. To analyze the fixed beams.
4. To determine slope and deflection of beams due to different loads.
5. 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
CO1	Infer the responses towards combined effect of loads and stresses.	L2 Understanding
CO2	Identify the stresses due to perpendicular load effects on structural parts and sections.	L3 Applying
CO3	Examine simple structures for deformation studies by conventional and/or energy concepts.	L4 Analyzing
CO4	Analyze the continuous beams and frames for typical determinate structures.	L4 Analyzing

CO-PO Mapping:

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

COs	PSO1	PSO2
CO.1	1	
CO.2	1	
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, Theory of earth retaining wall, Masonry Dam and Stability conditions 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.	08 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 (Only theory), Macaulay's method, moment-area method and conjugate beam method.	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	09 Hours
Unit 6: Energy Theorem Castiglione's theorem, Betti'slaw, Maxwell's reciprocal theorem. Deformations ofdeterminate beams, bents and portal frames by unit load method. Simple examples	06 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., CharotarPublication.
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:** Hydrology and Water Resources Engineering. **Course No.:** UCEPC0404	**L**	**T**	**P**	**Credits**
	02 hours per week	**---**	---	02

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:

COs	**After the completion of the course the students will be able to**	**Bloom's Taxonomy Descriptor**
CO.1	Explain the different terms of Hydrology and their application.	Cognitive (Understanding) L2
CO.2	Illustrate the components and requirements of Water Resources Structure and Irrigation.	Cognitive (Understanding) L2
CO.3	Identify the water requirements for crops in each command area.	Cognitive (Applying) L3
CO.4	Make use of different data for estimation of average Precipitation, losses to runoff, stream flow and flood.	Cognitive (Applying) L3

CO-PO Mapping:

CO	**PO1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**
CO1	2									1	1
CO2	2									1	1
CO3	3	1	3	2	1	2				2	1
CO4	3	1	3	2	1	2				2	1

CO	**PSO1**	**PSO2**
CO1	1	
CO2	1	
CO3	3	3
CO4	3	3

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: Surface Water Hydrology. 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).	8 Hours
Unit 3: Groundwater Hydrology. Occurrence and Distribution of Groundwater, Types of Aquifers, Specific Yield of Aquifer, Movement of Groundwater, Hydraulics of Well under Steady Flow Conditions in Confined and Unconfined Aquifers, Estimation of flows to wells.	7 Hours
Unit 4: Irrigation and Water Resources Structures. Introduction to Dams, Spillways, Energy Dissipation, Diversion Head Works, Canal Structures, Cross Drainage Works, Reservoir Planning. Definition and Necessity of Irrigation, Types of Irrigation, Different Systems of Irrigation. Duty, Delta, Factors affecting Duty, Methods of improving Duty, Assessment and Efficiencies of Irrigation Water. Crops Classification and Crop Rotation, Command Area-Calculations	8 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 wise Measurable Students Learning Outcome:

1. To understand Importance and Scope of Hydrology.
2. To learn average Precipitation, losses to runoff, stream flow and flood.
3. To understand Hydrograph.
4. To learn Occurrence and Distribution of Groundwater.
5. To understand Introduction to Dams.
6. To learn Necessity of Irrigation.

Unit Outcomes:

1. Explain Hydrologic Cycle, Types of Precipitation, Evaporation and Evapotranspiration **CO1.**

2. Explain different water resources structures like dam, Diversion Head Works, Canal Structures, Cross Drainage Works etc **CO2.**
3. Identify Distribution of Groundwater, duty, delta and Command Area-Calculations **CO3.**
4. Develop Hydrograph, Unit Hydrograph, S-Curve, Synthetic Unit Hydrograph (SUH) and Flood Hydrograph **CO4.**

Class: S. Y. B. Tech Environmental Engineering **Title of the Course:** Environmental Chemistry & Microbiology **Course No.:** UCEPC0405	**L**	**T**	**P**	**Credit**
	03 hours per week	-	-	3

Course Pre-Requisite:

Students shall have the knowledge of:

- Engineering Chemistry
- Biology
- Applied Mathematics

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:

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 concepts of quantitative, physical, colloidal and biochemistry required in Environmental Engineering and environmental significance of various parameters.	Understanding (L2)
CO.2	Apply analytical techniques to detect and quantify environmental contaminants.	Applying (L3)
CO.3	Illustrate the environmental characteristics of organic compounds and evaluate the dynamics of biogeochemical cycles such as the carbon, nitrogen, and phosphorus cycles.	Applying (L3)
CO.4	Apply the principles of environmental microbiology in water and wastewater engineering.	Applying (L3)

CO-PO Mapping:

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

COs	**PSO1**	**PSO2**
CO.1	1	
CO.2	1	
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: (A) 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. (B) Green Chemistry - Goals, Principles of Green Chemistry. (C) Environmental significance of pollutant parameters- Temperature, pH, Hardness, Iron, Manganese, Fluoride, Nitrogen, Phosphorous, Carbon, Sulphate, DO, BOD, COD, TOC.	**08 Hrs.**
Unit 2: (A) Basic Concepts from Colloidal Chemistry: Size, methods of formation, general properties, environmental significance, colloidal dispersion in liquids, colloidal dispersion in air (B) Basic concept from Instrumental Analysis: Absorption Spectroscopy- UV-visible, atomic absorption spectroscopy, flame photometry, Mass Spectroscopy and Gas Chromatography and its types, mass spectroscopy and gas chromatography. Colorimetric analysis, Flame photometer, Lambert's, and Beer's law.	**08 Hrs.**
Unit 3: (A) 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. (B) Environmental Characteristics of organic compounds: saturation concentration, solubility, hydrolysis, photolysis. (C) Bio-Geo Cycles: Phosphorous Cycle, Carbon Cycle, Nitrogen Cycle.	**07 Hrs.**
Unit 4: (A) Basic Concepts from Quantitative Chemistry: Significance of quantitative measurements, gravimetric analysis, volumetric analysis, physical methods of analysis (B) Basic Concepts from physical chemistry: Thermodynamics – Heat and work, energy, enthalpy, entropy, Vapour pressure of liquids, Solutions of solids in liquids, Oxidation, reduction, Dialysis, , Electro Chemistry, Chemical Kinetics Catalysis, Ion exchange.	**08 Hrs.**
Unit 5: (A) 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 heterotopic) 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. (B) Bacteriological techniques-MPN, Standard plate count, microorganisms other than coliform group.	**07 Hrs.**
Unit 6: (A) Biochemistry: Classification, Characteristics, Environmental significance of carbohydrates, high energy compounds, proteins, lipids. (B) Enzyme catalysis- characteristics, chemical and physical properties, its Classification, the nature, and mechanism of enzyme action (Enzyme catalysed reaction, energy diagram, Michalius - Menten equation), Factors affecting rate of enzymatic reaction. Enzyme inhibition, source enzyme and enzyme formation, dissociation, denaturation,	**07 Hrs.**

References:

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 Textbook of Microbiology”, S. Chand and Company Ltd., New Delhi, 2015.
3. 3. Dr. S. S. Dara and Dr. S. S. Umare, “A Textbook of Engineering Chemistry”, S. Chand and Company Ltd., New Delhi, 2017.
4. Pelczar, Jr, M.J., E.C.S., Krieg, R. Noel., and Pelczar Merna Foss. “Microbiology”, Tata McGraw Hill Publishing Company Limited, 5thedition., 1996.
5. 2. E.W. Rice, R.B. Baird, A.D. Eaton, L.S. Clesceri, “Standard Methods for the Examination of Water and Wastewater”, 22nd Edition
6. 3. Metcalf and Eddy “Wastewater Engineering Treatment and Reuse”, Tata McGraw Hill Publication, 6th Reprint. 2003.
7. 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:

Unit Learning Objectives:

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

Unit Outcomes:

Students will be able to

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

Title of the Course: Constitution of India	L	T	P	Credit
Course Code: UCEVE0406	2	--	--	2

Course Pre-Requisite: Basics of Indian History, Independence Movement, Fundamentals of Civics.

Course Description: This Course is an introduction of Indian Constitution and basic concepts highlighted in this course for understanding the Constitution of India. This course is structured to give a deeper insight for making the nexus between the other law subjects.

Course Objectives

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

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

Course Learning Outcomes:

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

CO-PO Mapping:

CO	1	2	3	4	5	6	7	8	9	10	11	PSO1	PSO2
CO1						3	3				3		
CO2						3	3	3	3		3		
CO3						3		3			3		
CO4						3		3			3		

Assessments:

Teacher Assessment:

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

Assessment	Marks
ISE	50

ISE: Assessment is based on Assignment/Declared Test/Quiz/Seminar/Group Discussions etc.

Course Contents:

Unit 1:- Constitution – Structure and Principles	**(03) Hrs.**
1.1: Meaning and importance of Constitution	
1.2: Making of Indian Constitution – Sources	

1.3: Salient features of Indian Constitution	
Unit 2:- Fundamental Rights and Directive Principles 2.1: Fundamental Rights & Fundamental Duties 2.2: Directive Principles of State Policy	**(10) Hrs.**
Unit 3:- Union Government & Executive 3.1: President of India – Qualification, Powers and Impeachment 3.2: Lok Sabha & Rajya Sabha Sabha- Composition, Powers & Functions, Scope to amendment in Constitution	**(04) Hrs.**
Unit 4:- State Government & Executive 4.1: Governor – Qualification, Appointment, Powers & Functions 4.2: Legislative Assembly & Legislative Council – Composition, Powers & Functions	**(03) Hrs.**
Unit 5:- The Judiciary 5.1: Features of Judicial System in India 5.2: Hierarchy of Courts, Composition and Jurisdiction	**(03) Hrs.**
Unit 6:- Local Self Government and other constitutional Organizations 6.1: 73rd and 74th Constitutional Amendments 6.2: Public Service Commission, Election Commission, CAG, National Commissions for SC, ST etc.	**(03) Hrs.**
Textbooks: 1. M.P. Jain, Indian Constitutional Law 2. M.P. Singh (ed.),V.N. Shukla, Constitutional Law of India 3. D.D. Basu, Commentary on the Constitution of India 4. S.S. Desai, Constitutional Law--I & II	
References: 1. Durga Das Basu, Introduction to the Constitution of India, Gurgaon; LexisNexis, 2018 (23rd edn.) 2. J.N. Pandey, The Constitutional Law of India, Allahabad; Central Law Agency, 2018 (55th edn.) 3. Shripad Shridhar Desai, Constitutional Law--I, S.S. Law Publication, 2021 4. Shripad Shridhar Desai, Constitutional Law --II, S.S. Law Publication, 2021 5. Constitution of India (Full Text), India.gov.in., National Portal of India, https://www.india.gov.in/sites/upload_files/npi/files/coi_part_full.pdf 6. Durga Das Basu, Bharatada Samvidhana Parichaya, Gurgaon; LexisNexis Butterworths Wadhwa, 2015	

Class: S. Y. B. Tech Civil & Environmental Engineering **Title of the Course:** Material Testing Laboratory **Course No.:** UCEPC0431	**L**	**T**	**P**	**Credit**
	---	---	02 hours per week	1

Course Pre-Requisite:

Students shall have the knowledge of:

- Basic civil engineering
- Building Materials

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 Objectives:

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

Course Learning Outcomes:

Cos	After the completion of the course the students will be able to	Bloom's Cognitive Descriptor
CO.1	Demonstrate properties of concrete ingredients. .	Cognitive (Understanding) L2
CO.2	Test concrete as per standards.	Cognitive (Create) L6

CO-PO Mapping:

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

COs	PSO1	PSO2
CO1		1
CO2	1	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 **Learning Outcome:** To Determine the particle size distribution of fine aggregates	2 Hours
Experiment No. 2: Flakiness and elongation index of aggregates **Learning Outcome:** To Determine Flakiness and elongation index of aggregates	2 Hours
Experiment No. 3: Crushing strength of aggregates **Learning Outcome:** To Determine Crushing strength of aggregates	4 Hours
Experiment No. 4: Determination Specific gravity of aggregates **Learning Outcome:** To Determine Specific gravity of aggregates	2 Hours

Experiment No. 5: Experiment on Silt content of fine aggregates **Learning Outcome:** To Determine Silt content of fine aggregates	2 Hours
Experiment No. 6: Test on bulking of sand **Learning Outcome:** To Determine bulking of sand	2 Hours
Experiment No. 7: Consistency test **Learning Outcome:** To Determine Consistency of cement	2 Hours
Experiment No. 8: Initial and final settling time **Learning Outcome:** To Determine Initial and final settling time of cement	
Experiment No. 9: Soundness Test of cement **Learning Outcome:** To Determine Soundness of cement	2 Hours
Experiment No. 10: Concrete mix design **Learning Outcome:** To design concrete mix for given strength	6 Hours
Experiment No. 11: Workability (Slump) test **Learning Outcome:** To Determine Workability of concrete	2 Hours
Experiment No. 12: Compressive Strength Test on concrete mix **Learning Outcome:** To Determine Compressive Strength of concrete	4 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

References:

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: -IS 10262:2009, IS 456:2000
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:** Environmental Chemistry and Microbiology Laboratory **Course No.:** UCEPC0432	**L**	**T**	**P**	**Credits**
	---	**---**	02 hours per week	01

Course Pre-Requisite:

Students shall have the basic 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:

COs	**After the completion of the course the students will be able to**	**Bloom's Taxonomy Descriptor**
CO.1	Carry out water or wastewater quality analysis through physical, chemical, biological methods.	Cognitive (Understanding) L2
CO.2	Apply microbiological techniques to isolate and identify microorganisms from environmental samples.	Cognitive (Applying) L3

CO-PO Mapping:

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

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

Assessments:

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

- **ISE:** Based on practical performed/ Internal oral.
- **ESE:** Based on practical performed/ External oral.

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	4 Hours
Experiment No. 3: Solids **Learning Outcome:** To determine total solids, suspended solids and dissolved solids of given water sample	4 Hours
Experiment No. 4: Dissolved Oxygen **Learning Outcome:** To determine dissolved oxygen of given water sample by Winkler	2 Hours

method	
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	4 Hours
Experiment No. 9: Standard Plate Count **Learning Outcome:** To estimate bacterial density by plate count method	4 Hours
Experiment No. 10: Most Probable Number **Learning Outcome:** To determine bacteriological quality of potable water	4 Hours
Field Projects: 1. To determine the water quality index of lake, reservoir, or any surface water body. **Learning Outcome:** To understand and determine quality of water.	1 Day

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 Pelczar Merna 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"

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

Class: S. Y. B. Tech Civil and Environmental Engineering **Title of the Course: Mini Project I** **Course No.: UCEIL0471**	**L**	**T**	**P**	**Credits**
	---	**---**	02 hours per week	01

Course Pre-Requisite:

Students shall have the knowledge of:

- **Basic Sciences**
- **Engineering Sciences**
- **Mathematics**

Course Description:

The Mini Project-I laboratory is designed to help students to develop practical ability and knowledge about practical tools/ techniques in order to solve real-life problems related to the industry, academic institutions, and research. The course Mini Project is one that involves practical work for understanding and solving problems in the field of Civil and Environmental Engineering. It provides the opportunity for students to demonstrate the application of their fundamental, analytical, and research skills, and to apply their knowledge to complex and real-world problems.

Course Learning Objectives:

1. To acquire knowledge to conduct research
2. Develop an experimental set-up to solve the problem, do testing, and validation of the results

Course Outcomes:

COs	**After the completion of the course the students will be able to**	**Bloom's Taxonomy Descriptor**
CO.1	Undertake research work using literature review, Experimentations, and computer simulations.	Psychomotor (Readiness to Act) L2
CO.2	Establish the findings for describing the work undertaken, results, and conclusions within the specified time frame.	Psychomotor (Ability to Perform) L5

CO-PO Mapping:

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

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

Assessments:

Assessment	**Weightage (Marks)**
ISE	25

- **ISE:** Assessment is based on the efforts of the students for formulating the problem, developing design solutions, testing and validating the solution and presentation.

Course Contents:

Students are expected to carry out independent research work on the selected topic. It is expected that the students formulate the research problem, develop/fabricate of experimental set-up (if any) and test and analysis of results thus obtained. The students are required to submit the report of mini project work and present their findings during the oral presentations.

Class: S. Y. B. Tech Civil and Environmental Engineering **Title of the Course:** Geospatial Laboratory **Course No.:** UCEVS0433	**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	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	3			3			3	2		3
CO2	3	2		2	2			3	2		3

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

Assessments:

Assessment	**Weightage (Marks)**
ISE	25

- **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. (CO1)	2 Hours

Experiment No. 2: Working with Symbology, Styling and Labelling • **Learning Outcome:** Layer Properties, styling vector layers, displaying labels, setting up scale-based visibility. (CO1)	2 Hours
Experiment No. 3: Georeferencing • **Learning Outcome:** Use of toposheets, activating Georeferencing tool in GIS, adding control points, transformation settings. (CO1)	4 Hours
Experiment No. 4: Data Creation and Editing (Digitization) • **Learning Outcome:** Introduction to vector layers, creating shape files in GIS, editing tools and functionalities. (CO2)	4 Hours
Experiment No. 5: Integrating Google Earth data • **Learning Outcome:** Integrating data created using Google Earth and its integration in GIS, working with KML files. (CO2)	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. (CO1)	4 Hours
Experiment No. 7: Digital Elevation Model (DEM) and Terrain Analysis • **Learning Outcome:** Preparation of DEM, contour map, slope map and other terrain maps. (CO2)	4 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. (CO2)	4 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. (CO2)	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. (CO2)	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. Bernhardensen, Tor. 1999. Geographic Information Systems: An Introduction. Toronto: John Wiley and Sons, Inc.
2. Nair, N. B. (1996): Encyclopaedia of Surveying, Mapping and Remote Sensing. Rawat Publications., Jaipur and New Delhi.

Websites:

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

Class: S. Y. B. Tech Civil and Environmental Engineering **Title of the Course: Co -Curricular Activities-I** **Course No.: UCECC0434**	**L**	**T**	**P**	**Credits**
	---	**---**	02 hours per week	01

Course Pre-Requisite:

- **None (**This course is open to all second-year engineering students interested in enhancing their personal and professional development through co-curricular activities.)

Course Description:

The Co-Curricular Activities course for second-year engineering students is designed to complement and enhance the academic experience by providing opportunities for personal growth, skill development, and community engagement outside the traditional classroom setting. This course encourages students to participate in a variety of activities that foster teamwork, leadership, creativity, and social responsibility.

Course Learning Objectives:

1. To promote holistic development by encouraging participation in a diverse range of activities.
2. To develop leadership and teamwork skills through active involvement in group activities and projects.
3. To enhance communication and interpersonal skills through interaction with peers, faculty, and community members.
4. To foster a sense of social responsibility and community engagement.
5. To provide opportunities for students to explore and cultivate personal interests and talents.

Assessments:

Assessment	Weightage (Marks)
ISE	50

- **ISE:** Assessment is based on the student's participation in various co-curricular activities

Course Contents:

Students will have the chance to engage in extracurricular pursuits such as clubs, sports, cultural events, volunteer work, and professional organizations. Through these activities, students will develop essential soft skills, including communication, collaboration, time management, and problem-solving, which are crucial for their future careers in engineering and beyond.

Class: S. Y. B. Tech Civil and Environmental Engineering **Title of the Course:** Statistics for Data Science **Course Code:** UCEMM0441	**L**	**T**	**P**	**Credit**
	03 hours per week	-	-	**03**

Course Pre-Requisite:

Students shall have knowledge of

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

Course Description:

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

Course Learning Objectives:

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

Course Outcomes:

CO	**After the completion of the course the student should be able to**	**Bloom's Taxonomy Descriptor**
CO1	Summarize patterns and trends in data including outliers and anomalies to visualize and interpret data distribution.	Cognitive (Understanding) L2
CO2	Apply appropriate statistical measures, data collection and data analysis techniques for grouped and ungrouped data cases.	Cognitive (Applying) L3
CO3	Examine the results of bivariate and multivariate regression and correlation analysis for linear and non-linear models.	Cognitive (Analyzing) L4
CO4	Analyze the probability concepts to statistical inference to solve variety of problems.	Cognitive (Analyzing) L4

CO-PO Mapping:

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

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

Assessments:

Assessment	Marks
ESE	100

ESE: Assessment is based on 100% course content.

Course Contents:

Unit 1: Meaning and Scope of Statistics Introduction, Definitions – Statistics as data, statistics as a method, subject matter of statistics, Laws of statistics, functions of statistics, importance of statistics, limitations of statistics, distrust of statistics, fallacies in statistics.	7 Hours
Unit 2: Statistical Survey and Data Collection Introduction, Planning of a statistical survey, Collection of data, Primary and secondary data, Methods of collecting primary data, Sources of secondary data, Unit of inquiry, Ways of collection of data, Processing of data.	7 Hours
Unit 3: Database Design and Presentation Spreadsheet tools, features and functions, formulas and functions, data storing, data analysis, types of charts, graphs and other features, classification, objectives, rules, modes of classification, tabulation, objectives, components of table, requisites of a good statistical table, types of tables.	7 Hours
Unit 4: Statistical Techniques Frequency distribution, grouped frequency distribution, cumulative frequency distribution, bivariate frequency distribution, measure of central tendency, mean, median, mode, geometric mean, harmonic mean, measure of dispersion, range, quartile deviation, mean deviation, standard deviation, variance, coefficient of dispersion, coefficient of variation.	8 Hours
Unit 5: Regional Statistical Analysis Joint and marginal distribution, curve fitting, least-square method, covariance, correlation, regression, simple correlation, linear and non-linear correlation, multiple regression analysis, stepwise regression analysis, use of computers in correlation and regression analysis.	8 Hours
Unit 6: Probability Concepts for Statistics Introduction, random experiments, sample space, events and algebra of events, definitions of probability – classical, statistical, and axiomatic, conditional probability, laws of addition and multiplication, independent events, theorem of total probability, Bayes' theorem and its applications.	8 Hours

Textbooks:

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

Reference Books:

1. Freund, J., "John E. Freund's Mathematical Statistical with Applications" Pearson Education, Asia.
2. Freund, J.E., and Miller, I.R., "Probability and Statistics for Engineers", Prentice – Hall of India, New Delhi.
3. Holder, R. L., "Multiple Regression in Hydrology", A Book by Institute of Hydrology.

4. Montgomery, D. C., and Runger, G. C., “Applied Statistics and Probability for Engineers”, Wiley.
5. Mood, A.M. Graybill, F.A. and Boes, D.C., “Introduction to the Theory of Statistics”, 3rd Edn., (Reprint), Tata McGraw-Hill Pub. Co. Ltd.
6. Mukhopadhyay, P., “Applied Statistics”, New Central Book Agency.

Unit Learning Objectives:

Make students to

1. Demonstrate ability in statistical theory necessary to understand statistical methods typically applied in data analysis.
2. Comprehend the methods of data collection and various statistical elementary tools.
3. Understand the concept of organizing data using classification and tabulation techniques.
4. Recognize the perceptions of measure of central tendency and measure of dispersion.
5. Understand the concepts of simple and multiple correlation and regression analysis.
6. Learn about different approaches to the theory of probability.

Unit Outcomes:

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

1. Explain the basics of statistics and its scope for real-world data analysis. (CO1)
2. Apply basic techniques of quantitative and qualitative data gathering. (CO1, CO2)
3. Illustrate the use of spreadsheets to analyze and present the data. (CO1, CO2)
4. Apply fundamental concepts of statistical properties to compare two or more series with regard to their variability to trace precise relationships. (CO2, CO3)
5. Measure the degree or extent to which two or more variables fluctuate with reference to one another. (CO2, CO3)
6. Demonstrate the concept of probability and its use in solving problems in various diversified situations. (CO4)

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

Course Pre-Requisite:

Basics of Project and Automation

Course Description:

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

Course Learning Objectives:

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

Course Outcomes:

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

CO-PO Mapping:

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

CO	PSO1	PSO2	PSO3
CO1		3	
CO2	2	3	

Assessments :

Teacher Assessment:

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

Assessment	Marks
ESE	100

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

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

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

Course Contents:

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

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

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

Reference Books:

1. Measurements And Instrumentation by U.A Bakshi , A.V Bakshi

2. Handbook of Construction Management for Instrumentation and Controls by K. Srinivasan, T. V. Vasudevan, S. Kannan, D. Ramesh Kumar

3. Strong Motion Instrumentation for Civil Engineering Structures by M. Erdik, M. Cilebi and N. Apyadin

4. DVS Murthy, Transducers and Instrumentation, PHI 2nd Edition 2013

5. Data Science for Civil Engineering: A Beginner's Guide Hardcover –R. K. Jain, Prashant Shantaram Dhotre , Deepak Tatyasaheb Mane, Parikshit Narendra Mahalle

6. Arun K. Ghosh, Introduction to measurements and Instrumentation, PHI, 4th

Edition 2012.

Unit wise Measurable Students Learning Outcomes:

ULO	After the completion of the course the student should be able to
ULO1	Understand history and need of data science and instrumentation in general
ULO2	Identify application of data science and instrumentation in Building projects
ULO3	Identify application of data science and instrumentation in water projects
ULO4	Identify application of data science and instrumentation in transportation projects
ULO5	Identify application of data science and instrumentation in Geotechnical projects
ULO6	Identify application of data science and instrumentation in surveying projects

Class: S. Y. B. Tech Civil & Environmental Engineering **Title of the Course:** Introduction to Human Resource management **Course Code: UCEMM0442**	**L**	**T**	**P**	**Credit**
	3	-	-	03

Course Pre-Requisite:

Students shall have the knowledge of:

- Basics of Management

Course Description:

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

Course Learning Objectives:

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

Course Outcomes:

COs	**After the completion of the course the students will be able to**	**Bloom's Cognitive Descriptor**
CO.1	Understand HRM, importance, evolution and difference from Personnel Management	Understanding (L2)
CO.2	Summarize the importance and methods of training, career planning and succession planning	Understanding (L2)
CO.3	Explain compensation management concepts, components, job evaluation, incentives, and benefits.	Understanding (L2)
CO.4	Identify performance appraisal methods	Applying (L3)

CO-PO Mapping:

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

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

Assessments :

Assessment	**Weightage (Marks)**
ESE	100

ESE: Assessment is based on 100% course content

Course Contents:

Unit 1:	

Introduction: Human resources Management-Introduction and Importance-Evolution – difference between Personnel Management and HRM- Strategic HRM- role of a HR Manager.	**08Hrs.**
Unit 2: **Human Resources Planning-** Objectives-Importance-HRP Process- Manpower Estimation-Job analysis-Job Description-Job Specification Recruitment-Sources of Recruitment-Selection Process-Placement and Induction-Retention of Employees.	**08 Hrs.**
Unit 3: **Training and Development-** Objectives and Needs-Training Process-Methods of Training –Tools and Aids-Evaluation of Training Programs Career Planning- Succession Planning	**07 Hrs.**
Unit 4: **Performance Management System-**Definition, Concepts and Ethics-Different methods of Performance Appraisal- Rating Errors-Competency management	**07 Hrs.**
Unit 5: **Compensation Management –**Concepts and Components-Job Evaluation- Incentives and Benefits. Productivity Management-Concepts-TQM-Kaizen-Quality Circles	**08 Hrs**
Unit 6: **Industrial relations-Grievance Procedure-**collective Bargaining-Settlement of Disputes. Retirement/Separation-Superannuation-Voluntary Retirement Schemes- Resignation-Discharge-Dismissal-Suspension-Layoff	**07 Hrs**
Textbooks: 1. Managing Human Resources - R.S. Dwiwedi 2. Human Resources Management- Gary Dessler 3. Personnel Management – C.B Mamoria 4. Human Resources Management-V.P.Michael	
References: 1. Human Resources Management – L.M.Prasad 8. Human Resources Management - Ashwathappa 2. 9. Managing Human Resources - Arun MonppaKotter, J. P. (1999). “What Effective General Managers Really Do,” Harvard Business Review, March–April 1999, pp. 145–159., 3. Organizational Behaviour - Fred LuthansHannaway, J. (1989). Managers Managing: The Workings of an Administrative System. New York: Oxford University Press, P. 39., 4. Eccles, R. G. & Nohria, N. (1992). Beyond the Hype: Rediscovering the Essence of Management. Boston: The Harvard Business School Press, p. 47.	

Class: B. Tech Civil and Environmental Engineering **Title of the Course:** Advanced Construction Technology (EXIT COURSE) **Course No.:** UCEEX0491	**L**	**T**	**P**	**Credits**
	03 hours per week	---	---	03

Course Pre-Requisite:

Students shall have the knowledge of:

- Basic Civil Engineering
- Concrete Technology

Course Description:

This course will help the students to understand technologies involved in construction sector. This course will cover various technologies involved in construction of various structure, their standard procedures, suitability, significance, advantages and disadvantages.

Course Learning Objectives:

1. To understand various technologies used in the construction sector.
2. To understand different types of temporary structures.
3. To understand advance concrete processes.
4. To understand different methods of excavation.

Course Outcomes:

COs	**After the completion of the course the students will be able to**	**Bloom's Cognitive Descriptor**
CO.1	Explain techniques involved in underwater construction.	Cognitive (Knowledge) L1
CO.2	Select appropriate type of temporary structure for various construction projects.	Cognitive (Understanding) L2
CO.3	Demonstrate techniques involved in concrete technology.	Cognitive (Apply) L3
CO.4	Correlate various techniques and equipment's involved in excavation of earth.	Cognitive (Analyse) L4

CO-PO Mapping:

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

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

Assessments:

Assessment	**Weightage (Marks)**
ISE	100

- **ISE:** Assessment is based on 100% course content

Course Contents:

Underwater Construction	45 Hrs.

a) Coffer Dams: Introduction, definition, types of coffer dams, selection of coffer dams, design features of coffer dams, leakage prevention and economical height of cofferdam.
b) Control of Ground water in Excavations: Introduction, methods: pumping, well points, bore wells, electro-osmosis, chemical, freezing process, vibro-flotation.

Temporary Works

a) Form work for R.C.C. Wall, slab, beam and column, centering for arches of large spans, design features for temporary works, slip formwork.
b) Scaffolding: Requirements, terminology, types, erections

Advance concrete technology

Sprayed concrete; underwater concrete; grouts, grouting and grouted concrete; mass concrete; pumped concrete; concrete for liquid retaining structures; vacuum process; concrete coatings and surface treatments, RMC

Pavement Construction

Construction of concrete pavement by techniques like vacuum processing Revibrating concrete, Roller –compacted concrete. Use of techniques like slip form paving in pavement construction; using Wet MIX macadam in Road. Advanced Techniques, vacuum dewatering in concrete slab construction

Excavation work

a) Mechanical v/s manual construction, Excavation in Earth: Earth moving equipment- Tractors, Bulldozers, Scrappers, Power shovel, Hoe Types.
b) Drag line, Clamshell, Trenchers, Compactors, Tippers, Cranes
c) Quantity evolution of any equipment

Excavation in hard rock

a) Excavation in hard rock: Rippers, Jack Hammers, Drills, Compressors and Pneumatic Equipment.
b) Blasting Explosives, Detonators, Fuses, Drainage in excavation –Necessity and Methods of Dewatering

Textbooks:

1. Developing New Entrepreneurs - Entrepreneurship Development Institute of Formwor kdesign and construction---- Wynn
2. Concrete Technology--- M.S. Shetty S.Chand publication

References:

1. Handbook of Composite construction Engg--- G.M. Sabanis
2. Formwork design and construction---- Wynn
3. Bridge Engineering--- Raina
4. Bridge engineering Punnuswamy

Class: S. Y. B. Tech. Civil and Environmental Engineering **Title of the Course:** Civil Drafting (EXIT COURSE) **Course No.:** UCEEX0492	**L**	**T**	**P**	**Credits**
	01	---	04	03

Course Pre-Requisite:

Students shall have the knowledge of:

- Computer Aided Engineering Drawing
- Basic Civil Engineering
- Basic Mathematics and Geometry

Course Description:

The Civil Drafting Lab course is designed to provide second-year Civil and Environmental Engineering students who wants to exit the program, with practical experience in civil engineering drafting techniques. Students will learn to create detailed technical drawings and plans using both manual drafting methods and computer-aided design (CAD) software. The course covers the fundamentals of civil drafting, including site plans, grading plans, utility plans, and environmental impact drawings. Through hands-on exercises and projects, students will develop the skills necessary to produce precise and professional engineering drawings that adhere to industry standards.

Course Learning Objectives:

1. To understand and apply basic principles of civil drafting.
2. To develop proficiency in creating detailed technical drawings using CAD software.
3. To produce accurate site plans, grading plans, and utility plans.
4. To interpret and implement industry standards and specifications in drafting.

Course Outcomes:

COs	**After the completion of the course the students will be able to**	**Bloom's Cognitive Descriptor**
CO1	Apply basic principles of civil drafting	Cognitive (Applying) L3
CO2	Make use of CAD software for creating detailed technical drawings	Cognitive (Applying) L3

CO-PO Mapping:

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	2	-	-	2	-	2	2		-	2	
CO2	3	-	3	-	2	2		2	3		2

COs	**PSO1**	**PSO2**
CO1	2	-
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: 75 Hours (15 lectures + 60 Practical)

- Hands-on drafting assignments using manual and CAD techniques.
- Creation of comprehensive site, grading, and utility plans.
- Application of environmental considerations in civil drafting projects.
- Peer review and presentation of completed drafting projects.

Class: S. Y. B. Tech. Civil and Environmental Engineering	**L**	**T**	**P**	**Credits**
Course: Construction Site Supervision Training (EXIT COURSE) **Course No.:** UCEEX0493	---	---	04	02

Course Pre-Requisite:

Students shall have the knowledge of:

- Basic Civil Engineering
- Building Planning and Design
- Building Construction Technology
- Knowledge of construction materials

Course Description:

The Construction Site Supervision Lab course is designed for second-year Civil and Environmental Engineering students (who wants to exit the program) to provide hands-on experience in managing and supervising construction sites. This course focuses on the practical aspects of construction supervision, including site safety, quality control, project management, and effective communication. Students will engage in real-world scenarios and simulated construction projects to develop essential skills for overseeing construction activities, ensuring compliance with design specifications, and maintaining a safe and efficient work environment.

Course Learning Objectives:

1. To understand the roles and responsibilities of a construction site supervisor.
2. To develop skills in site safety management and implementation of safety protocols.
3. To gain proficiency in quality control and assurance practices on construction sites.

Course Outcomes:

COs	**After the completion of the course the students will be able to**	**Bloom's Cognitive Descriptor**
CO1	Understand the roles and responsibilities of a construction site supervisor.	Cognitive (Understanding) L2
CO2	Develop skills in site safety management and quality control assurance practices on construction sites.	Cognitive (Applying) L3

CO-PO Mapping:

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	2	-	-	2	-	2	2		-	2	
CO2	3	-	3	-	2	2		2	3		2

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

Assessments:

Assessment	**Weightage (Marks)**
ISE	50

ISE is based on Presentations and Report submission by students for their training done.

Course Contents: Students will be deputed to actual construction site to learn: 60 Hours

- Introduction to Construction Site Supervision
- Safety inspections and implementation of safety measures.
- Quality control tests and inspections of construction materials and methods.
- Project scheduling and progress tracking.
- Site layout planning and organization exercises.
- Role-playing scenarios for communication and coordination.