Study & Evaluation Scheme of Bachelor of Technology in Civil Engineering

[Applicablefor2022-26]
Version 2022.

[As per CBCS guidelines given by UGC]

Version	Approved in BOS	Approved in BOF	Approved in Academic Council
2022	28/05/2022	08/08/2022	20/10/2022 Vide Agenda No. 8.4.1

Quantum University, Roorkee
22 KM Milestone, Dehradun-Roorkee Highway, Roorkee (Uttarakhand)
Website: www.quantumuniversity.edu.in

Quantum University, Roorkee

22 KM Milestone, Dehradun-Roorkee Highway, Roorkee (Uttarakhand)

Study &Evaluation Scheme

Study Summary

Name of the Faculty	Faculty of Technology
Name of the School	Quantum School of Technology
Name of the Department	Department of Civil Engineering
Program Name	Bachelor of Technology in Civil Engineering
Duration	4 Years
Medium	English

Evaluation Scheme

Type of Papers	**Internal Evaluation (%)**	**End Semester Evaluation (%)**	**Total (%)**
Theory	40	60	100
Practical/Dissertations/Project Report/Viva-Voce	40	60	100
Internal Evaluation Components(Theory Papers)			
Mid Semester Examination	60Marks		
Assignment–I	30Marks		
Assignment-II	30Marks		
Attendance	30Marks		
Internal Evaluation Components(Practical Papers)			
Quiz One	30Marks		
Quiz Two	30Marks		
Quiz Three	30Marks		
Lab Records/Mini Project	30Marks		
Attendance	30Marks		
End Semester Evaluation (Practical Papers)			
ESE Quiz	40Marks		
ESE Practical Examination (write-up)	20Marks		
Viva-Voce	20Marks		
Practical performance	20Marks		

Structure of Question Paper (ESE Theory Paper)

The question paper will consist of 5 questions, one from each unit. Student has to Attempt all questions. All questions carry 20 marks each. Parts a) and b) of question Q1 to Q5 will be compulsory and each part carries 2 marks. Parts c), d) and e) of Q1 to Q5 Carry 8 marks each and the student may attempt any 2 parts.

Important Note:

1. *The purpose of examination should be to assess the Course Outcomes (CO) that will ultimately lead to attainment of Programme Specific Outcomes (PSOs). A question paper must assess the following aspects of learning: Remember, Understand, Apply, Analyze, Evaluate & Create (reference to Bloom's Taxonomy). The standard of question paper will be based on mapped BL level complexity of the unit of the syllabus, which is the basis of CO attainment model adopted in the university.*

2. Case Study is essential in every question paper (wherever it is being taught as a part of pedagogy) for evaluating higher-order learning. Not all the courses might have case teaching method used as pedagogy.

3. There shall be continuous evaluation of the student and there will be a provision ofreal time reporting on QUMS. All the assignments will evaluated through module available on ERP for time and access management of the class.

Program Structure – Bachelor of Technology in Civil Engineering

Introduction

Bachelor of Technology in Civil Engineering syllabus is broad and multidisciplinary consists of various courses in Structural Engineering, Environmental Engineering, Geotechnical Engineering, Transportation Engineering, Construction Engineering, Urban and Community Planning apart from supporting courses in Basic Sciences, Humanities, and Agricultural Engineering.

The Bachelor of Technology in Civil Engineering subjects are designed in such a way that students grasp all the knowledge related to Civil Engineering and environmental science. Towards enhancing employability and entrepreneurial ability of the graduates the Quantum University increase the practical content in the courses wherever necessary. The total number of credit hours is 8 semesters including Student READY programme will range from 175 to 187 for all the programmes.

In order to harness regional specialties and to meet region-specific needs the Quantum University modify the content of syllabus as per the regional demands and needs The Quantum University offering the specializations like majoring in Structural Engineering, Geotechnical Engineering, Transportation Engineering, Environmental Engineering, Water Resource Engineering.

SUMMER CAMP: This program will be undertaken by the students for a total duration of 02 weeks with a weightage of credit. It will consist of general orientation and outside-campus training in hilly location. The students would be attached with the sloppy terrain to get an experience of the environment and working. Due weightage in terms of credit hours will be given depending upon the duration of stay of students in the camp. At the end of survey camp, the students will be given one week for project report preparation, presentation and evaluation.

The students would be required to record their observations in field on daily basis and will prepare their project report based on these observations.

Curriculum (22-26) Version 2022.01

Quantum School of Technology

Department of Civil Engineering

Bachelor of Technology in Civil Engineering– **PC: 01-3-10**

BREAKUP OF COURSES

Sr. No	CATEGORY	CREDITS
1	Foundation Core (FC)	42
2	Program Core (PC)	72
3	Program Electives (PE)	15 (+ 12)
4	Open Electives (OE)	9
5	Project	14
6	Internship	5
7	Value Added Programs (VAP)	15
8	General Proficiency	7
9	Disaster Management*	2*
TOTAL NO. OF CREDITS		179
TOTAL NO. OF CREDITS (Honors)		189

*Non-CGPA Audit Course

*Non-CGPA Audit Course

DOMAIN-WISE BREAKUP OF CATEGORY

Domain	Foundation core	Program core	Program elective	Sub total	%age
Sciences	15	-	-	15	8.57
Humanities	4	-	-	4	1.14
Engineering	23	91	15	129	73.71
Open elective			9	9	5.14
VAP				15	7.42
GP				7	4
Disaster Preparedness &Management*				2*	0
Grand Total	**40**	**91**	**24**	**179**	**100**

#Credits of projects and internships included

*Non-CGPA Audit Course

SEMESTER-WISE BREAKUP OF CREDITS

Sr. No	CATEGORY	SEM 1	SEM 2	SEM 3	SEM 4	SEM 5	SEM 6	SEM 7	SEM 8	TOTAL
1	Foundation Core	19	22	1	-	-	-	-	-	42
2	Program Core	-	-	19	17	15	12	9	-	72
3	Program Electives	-	-	-	-	-	3	6	6	15 (+ 12)
4	Open Electives	-	-	-	3	3	3	-	-	9
5	Projects	-	-	2	2	2	2	2	4	14
6	Internships	-	-	1	-	2	-	2	-	5
7	VAPs	1	2	2	2	2	4	2	-	15
8	GP	1	1	1	1	1	1	1	-	7
9	Disaster Preparedness &Management*									2*
	TOTAL	**21**	**25**	**26**	**25**	**25**	**25**	**22**	**10**	**179**

H- Honors program *Non-CGPA Audit Course

Minimum Credit Requirements:

B.Tech.: = 179 Credits
With Honors: 177 +12 = 189 credits

Group B (B.Tech CE/EE/ME/MTE/PT)

SEMESTER 1

Course Code	Category	Course Title	L	T	P	C	Version	Course Prerequisite
MA3102	FC	Mathematics I	3	2	0	4	2.0	Nil
PS3101	FC	Human Values and Ethics	2	0	0	2	1.0	Nil
CS3101	FC	Basics of Computer and C Programming	4	0	0	4	2.0	Nil
EC3101	FC	Basic Electrical and Electronics Engineering	3	1	0	4	1.1	Nil
CS3140	FC	Basics of Computer and C Programming Lab	0	0	2	1	1.0	Nil
EC3140	FC	Basic Electrical and Electronics Engineering Lab	0	0	3	2	1.0	Nil
ME3142	FC	Engineering Graphics and Design	0	0	4	2	1.0	Nil
VP3101	VAP	Communication and Soft Skills-I	0	0	2	1	1.0	Nil
GP3101	GP	General Proficiency	0	0	0	1		Nil
		TOTAL	**12**	**3**	**11**	**21**		

Contact Hrs. 26

SEMESTER 2

Course Code	Category	Course Title	L	T	P	C	Version	Course Prerequisite
MA3202	FC	Mathematics II	3	2	0	4	1.0	MA3102
PH3101	FC	Engineering Physics	3	1	0	4	1.0	Nil
CY3205	FC	Environmental Studies	2	0	0	2	1.0	Nil
ME3103	FC	Fundamentals of Mechanical & Mechatronics Engineering	3	0	0	3	1.0	Nil
CS3207	FC	Advance Computer Programming& Software	4	0	0	4	1.0	Nil
PH3140	FC	Engineering Physics Lab	0	0	2	1	1.0	Nil
CS3245	FC	Advance Computer Programming & Software Lab	0	0	2	1	1.0	Nil
ME3140	FC	Workshop Practice	0	0	3	2	1.0	Nil
VP3201	VAP	Communication and Soft Skills-II	1	0	2	2	1.0	Nil
CE3102		Disaster Preparedness &Management*	2	0	0	2*	1.0	Nil
GP3201	GP	General Proficiency	0	0	0	1		Nil
HU3201	FC	Indian Knowledge System	1	0	0	1		Nil
		TOTAL	**19**	**3**	**9**	**25**		

*Non-CGPA Audit Course

Contact Hrs. 31

SEMESTER 3

Course Code	Category	COURSE TITLE	L	T	P	C	Version	Course Prerequisite
CE3308	PC	Applied Hydraulics	3	0	0	3	1.0	Nil
CE3310	PC	Basics of Geology & Rock Mechanics	3	0	0	3	1.0	Nil
CE3312	PC	Material Testing & Evaluation	3	0	0	3	1.0	Nil
CE3313	PC	Construction Engineering & Management	2	0	0	2	1.0	Nil
ME3308	PC	Strength of Materials	3	2	0	4	1.0	Nil
CE3345	PC	Material Testing & Evaluation Lab	0	0	2	1	1.0	Nil
CE3347	PC	Fluid Mechanics & Hydraulics Lab	0	0	2	1	1.0	Nil
CE3349	PC	Geology Lab	0	0	2	1	1.0	Nil
ME3344	PC	Strength of Materials Lab	0	0	2	1	1.0	Nil
CE3344	P	Project Lab I	0	0	4	2	1.0	Nil
VP3301	VAP	Communication and Soft Skills-III	1	0	2	2	1.0	
CE3370	FW	Internship Presentation I	1	0	0	1		
GP3301	GP	General Proficiency	0	0	0	1		
HU3202	FC	United Nations Development Programme	1	0	0	1		
	Total		**17**	**2**	**14**	**26**		

Contact Hrs. 33

SEMESTER 4

Course Code	Category	COURSE TITLE	L	T	P	C	Version	Course Prerequisite
CE3403	PC	Structural Analysis	3	2	0	4	1.0	Nil
CE3407	PC	Environment Engineering	2	0	0	2	1.0	Nil
CE3408	PC	Soil Mechanics	3	2	0	4	1.0	Nil
CE3409	PC	Basics of Ground Surveying	3	0	0	3	1.0	Nil
CE3442	PC	Structural Analysis lab	0	0	2	1	1.0	Nil
CE3446	PC	Environment Engineering Lab	0	0	2	1	1.0	Nil
CE3447	PC	Soil Mechanics Lab	0	0	2	1	1.0	Nil
CE3448	PC	Basics of Ground Surveying lab	0	0	2	1	1.0	Nil
CE3444	P	Project lab II	0	0	4	2	1.0	Nil
	OE	Open Elective I	3	0	0	3		
VP3401	VAP	PDP for Managers III	2	0	0	2	1.0	
GP3401	GP	General Proficiency	0	0	0	1		
	Total		**16**	**4**	**12**	**25**		
All students are required to attend two weeks survey camp after 4th semester. Performance of this camp will be evaluated and awarded in 5th semester.								

Contact Hrs.32

Open Elective I

Course Code	Category	COURSE TITLE	L	T	P	C	Version	Course Prerequisite
CE3011	OE	Carbon Emission & Control	3	0	0	3	1.0	Nil
CS3021	OE	Mining and Analysis of Big data	3	0	0	3	1.0	Nil
AG3011	OE	Ornamental Horticulture	3	0	0	3	1.0	Nil
BB3011	OE	Entrepreneurial Environment in India	3	0	0	3	1.0	Nil
JM3011	OE	Media Concept and Process (Print and Electronic)	3	0	0	3	1.0	Nil
HM3011	OE	Indian Cuisine	3	0	0	3	1.0	Nil
MB3011	OE	SAP 1	3	0	0	3	1.0	Nil
EG3011	OE	French Beginner A1	3	0	0	3	1.0	Nil
MT3011	OE	Elementary Robotics	0	0	5	3	1.0	Nil

SEMESTER -5

Course Code	Category	COURSE TITLE	L	T	P	C	Version	Course Prerequisite
CE3501	PC	Advance Structural Analysis	2	2	0	3	1.0	CE3403
CE3503	PC	Design of Steel Structures	2	2	0	3	1.0	Nil
CE3504	PC	Transportation Engineering	3	0	0	3	1.0	Nil
CE3508	PC	Design of Reinforced Concrete Structures	3	2	0	4	1.0	Nil
CE3542	PC	Transportation Engineering lab	0	0	2	1	1.0	Nil
CE3544	PC	Advanced Structure Analysis Lab	0	0	2	1	1.0	Nil
	OE	Open Elective II	3	0	0	3		-
CE3543	P	Project lab V	0	0	4	2	1.0	-
VP3501	VAP	Reasoning Ability	2	0	0	2	1.0	-
CE3571	FW	Survey Camp	2	0	0	2	1.0	-
GP3501	GP	General Proficiency	0	0	0	1		-
	Total		**17**	**6**	**8**	**25**		

Contact Hrs. 31

Open Elective II

Course Code	Category	COURSE TITLE	L	T	P	C	Version	Course Prerequisite
CE3013	OE	Environment Pollution and Waste Management	3	0	0	3	1.0	Nil
CS3023	OE	Big Data Analytics: HDOOP Framework	3	0	0	3	1.0	Nil
AG3013	OE	Organic farming	3	0	0	3	1.0	Nil
BB3013	OE	Establishing a New Business	3	0	0	3	1.0	Nil
JM3013	OE	Photo Journalism	3	0	0	3	1.0	Nil
HM3013	OE	Chinese Cuisine	3	0	0	3	1.0	Nil
MB3013	OE	SAP 3	3	0	0	3	1.0	Nil
EG3013	OE	French Intermediate B1	3	0	0	3	1.0	Nil
EG3002	OE	Report Writing	3	0	0	3	1.0	Nil
MT3013	OE	Introduction to Automation	3	0	0	3	1.0	Nil

SEMESTER -6

Course Code	Category	COURSE TITLE	L	T	P	C	Version	Course Prerequisite
CE3609	PC	Advanced Design of Concrete Structures	3	0	0	3	1.0	CE3508
CE3610	PC	Water Resources Engineering	3	0	0	3	1.0	CE3308
CE3612	PC	Geotechnical Engineering	3	2	0	4	1.0	CE3408
CE3641	PC	Geotechnical Engineering lab	0	0	2	1	1.0	Nil
CE3643	VAP	Technical VAP I	2	0	0	2	1.0	-
CE3644	PC	Water Resources Engineering Lab	0	0	2	1	1.0	
	PE	Program Elective I	3	0	0	3	1.0	
	OE	Open Elective III	3	0	0	3		
CE3642	P	Project lab IV	0	0	4	2	1.0	
VP3601	VAP	GD/PI	2	0	0	2	1.0	
GP3601	GP	General Proficiency	0	0	0	1		
	Total		**19**	**2**	**8**	**25**		
All students are required to attend Six weeks summer internship after 6th semester. Performance of this internship will be evaluated and awarded in 7th semester.								

Contact Hrs. 29

Open Elective III

Course Code	Category	COURSE TITLE	L	T	P	C	Version	Course Prerequisite
CE3015	OE	Hydrology	3	0	0	3	1.0	Nil
CS3025	OE	Data Science Models : Regression, Classification and Clustering	3	0	0	3	1.0	Nil
AG3015	OE	Mushroom Cultivation	3	0	0	3	1.0	Nil
BB3015	OE	E-commerce	3	0	0	3	1.0	Nil
JM3015	OE	Media industry and Management	3	0	0	3	1.0	Nil
HM3015	OE	Italian Cuisine	3	0	0	3	1.0	Nil
MB3015	OE	SAP 5	3	0	0	3	1.0	Nil
EG3015	OE	French Advance C1	3	0	0	3	1.0	Nil
MT3015	OE	Robotic Industry 4.0	3	0	0	3	1.0	Nil

SEMESTER 7

Course Code	Category	COURSE TITLE	L	T	P	C	Version	Course Prerequisite
CE3701	PC	Health, Safety and Environment Management	4	0	0	4	1.0	Nil
CE3702	PC	Estimation and Costing	4	0	0	4	1.0	Nil
CE3740	P	Project Lab V	0	0	4	2	1.0	Nil
CE3741	PC	Estimation Lab	0	0	2	1	1.0	Nil
	PE	Program Elective-II	3	0	0	3	1.0	
	PE	Program Elective-III	3	0	0	3	1.0	
CE3770	FW	Internship Presentation	2	0	0	2		
CE3742	VAP	Technical VAP II	2	0	0	2	1.0	
GP3701	GP	General Proficiency	0	0	0	1	-	-
		TOTAL	**18**	**0**	**6**	**22**		

Contact Hrs.24

SEMESTER 8

Course Code	Category	COURSE TITLE	L	T	P	C	Version	Course Prerequisite
	PE	Program Elective-IV	3	0	0	3	1.0	Nil
	PE	Program Elective-V	3	0	0	3	1.0	Nil
CE3870	FW	Project	0	0	0	4		
		TOTAL	**6**	**0**	**0**	**10**		

Contact Hrs.6

OR								
It is prerogative of the university to allow the student to opt for this option only after completing the process of approval before proceed on full semester internship on an industrial project. The evaluation of internal components should be done jointly by industrial supervisor and university supervisor. End semester evaluation should be done by a committee comprise of at least one expert from industry/corporate.								
Course Code	**Category**	**COURSE TITLE**	**L**	**T**	**P**	**C**	**Version**	**Course Prerequisite**
CE3871	FW	Major Industrial Project	0	0	0	10		
		TOTAL	**0**	**0**	**0**	**10**		

Program Elective (PE) Courses/ Specialization

Category	Course Code	COURSE TITLE	L	T	P	C	Version	Course Prerequisite
1	CE3608	Geomatics Engineering	3	0	0	3	1.0	Nil
	CE3609	Building Construction Practice	3	0	0	3	1.0	Nil
	CE3611	Construction Project Planning & System	3	0	0	3	1.0	Nil
	CE3613	Construction Cost Analysis	3	0	0	3	1.0	Nil
II	CE3703	Bridge Engineering	3	0	0	3	1.0	Nil
	CE3705	Earth Quake Resistant Constructions	3	0	0	3	1.0	Nil
	CE3709	Masonry Structures	3	0	0	3	1.0	Nil
	CE3710	Pre-Stressed Concrete	3	0	0	3	1.0	Nil
	CE3711	System Engineering & Economics	3	0	0	3	1.0	Nil
III	CE3706	Hydrology	3	0	0	3	1.0	Nil
	CE3707	Irrigation Engineering	3	0	0	3	1.0	Nil
	CE3712	Urban Hydrology & Hydraulics	3	0	0	3	1.0	Nil
	CE3713	Open Channel Flow	3	0	0	3	1.0	Nil
	CE3714	Hydraulic Modelling	3	0	0	3	1.0	Nil
IV	CE3801	Environmental Impact Assessments	3	0	0	3	1.0	Nil
	CE3802	Groundwater Improvement Technology	3	0	0	3	1.0	Nil
	CE3811	Water & Air Quality Modelling	3	0	0	3	1.0	Nil
	CE3812	Soil & Hazardous Waste Management	3	0	0	3	1.0	Nil
	CE3814	Air & Noise Pollution Control	3	0	0	3	1.0	Nil
	CE3815	Sustainable Engineering & Technology	3	0	0	3	1.0	Nil
V	CE3804	Advance Transportation Engineering	3	0	0	3	1.0	Nil
	CE3816	Pavement Materials	3	0	0	3	1.0	Nil
	CE3817	Pavement Design	3	0	0	3	1.0	Nil
	CE3818	Urban Transportation Planning	3	0	0	3	1.0	Nil
	CE3819	Infrastructure Planning & Design	3	0	0	3	1.0	Nil
	CE3820	Entrepreneurship Management In Civil Engineering	3	0	0	3	1.0	Nil
	CE3821	Low Cost Housing	3	0	0	3	1.0	Nil
	CE3822	Airport & Harbor Planning	3	0	0	3	1.0	Nil
Student can opt for course in MOOC platform after getting proper approval from department								

B. Choice Based Credit System (CBCS) Choice Based Credit System (CBCS) is a versatile and flexible option for each student to achieve his target number of credits as specified by the UGC and adopted by our university.

The following is the course module designed for the Bachelor of Technology in Civil Engineering program:

Core competency: Students will acquire core competency in Bachelor of Technology in Civil Engineering and in allied subject areas.

Skilled communicator: The course curriculum incorporates basics and advanced training in order to make a graduate student capable of expressing the subject through technical writing as well as through oral presentation.

Critical thinker and problem solver: The course curriculum also includes components that can be helpful to graduate students to develop critical thinking ability by way of solving problems/numerical using basic& advance knowledge and concepts of civil engineering.

Sense of inquiry: It is expected that the course curriculum will develop an inquisitive characteristic among the students through appropriate questions, planning and reporting experimental investigation.

Skilled project manager: The course curriculum has been designed in such a manner as to enabling a graduate student to become a skilled project manager by acquiring knowledge about mathematical project management, writing, planning, study of ethical standards and rules and regulations pertaining to scientific project operation.

Ethical awareness/reasoning: A graduate student requires understanding and developing ethical awareness/reasoning which the course curriculums adequately provide.

Lifelong learner: The course curriculum is designed to inculcate a habit of learning continuously through use of advanced ICT technique and other available techniques/books/journals for personal academic growth as well as for increasing employability opportunity.

Value Added Course (VAC): A value added audit course is a non-credit course which is basically meant to enhance general ability of students in areas like soft skills, quantitative aptitude and reasoning ability - required for the overall development of a student and at the same time crucial for industry/corporate demands and requirements. The student possessing these skills will definitely develop acumen to perform well during the recruitment process of any premier organization and will have the desired confidence to face the interview. Moreover, these skills are also essential in day-to-day life of the corporate world. The aim is to nurture every student for making effective communication, developing aptitude and a general reasoning ability for a better performance, as desired in corporate world.

Skill Enhancement Course: This course may be chosen from a pool of courses designed to provide value-based and/or skill-based knowledge.

Open Elective (OE): Open Elective is an interdisciplinary additional subject that is compulsory in a program. The score of Open Elective is counted in the overall aggregate marks under Choice Based Credit System (CBCS). Each Open Elective paper will be of 3 Credits in IV, V and VI semesters. Each student has to take Open Electives from department other than the parent department. Core / Discipline Specific Electives will not be offered as Open Electives.

Program Course (PC): This is a compulsory course but audit that does not have any choice and may be of 3 credits. Each student of Bachelor of Technology in civil engineering program has to compulsorily pass the Environmental Studies and Human values & professional Ethics

C. Program Outcomes of Bachelor of Technology in Civil Engineering

Program Outcomes (POs)

The curriculum and syllabus have been structured in such a way that each of the courses meets one or more of these outcomes. Program outcomes describe what students are expected to know and be able to do by the time of graduation. These relate to the skills, knowledge and behaviors that students acquire as they progress through the program. Further each course in the program spells out clear course outcomes (COs) which are mapped to the program outcomes.

Engineering Graduate will be able to:

Program – Bachelor of Technology in Civil Engineering		
PO-01	**Engineering knowledge**	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex civil engineering problems.
PO-02	**Problem analysis**	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO-03	**Design/development of solutions**	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO-04	**Conduct investigations of complex problems**	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO-05	**Modern tool usage**	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO-06	**The engineer and society**:	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO-07	**Environment and sustainability**:	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO-08	**Ethics**	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO-09	**Individual and team work**	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO-10	**Communication**:	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make

		effective presentations, and give and receive clear instructions.
PO-11	**Project management and finance**:	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO-12	**Lifelong learning**	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

D. Program Specific Outcomes (PSO's)

PSO1. Enhancing the employability skills by making the students find innovative solutions for challenges and problems in domains of Civil Engineering.

PSO2: Inculcating in students tech suaveness to deal with practical aspects of Civil Engineering.

E. Program Educational Objectives (PEO's)

PEO1. To be well familiar with the concepts of Civil Engineering for leading a successful career in industry or as entrepreneur or to pursue higher education.

PEO 2. To develop techno-commercial skills for providing effective solution using knowledge of Civil Engineering

PEO 3. To instil lifelong learning approach towards constantly evolving technologies with innovative and ethical mindset

F. Pedagogy & Unique practices adopted:

"Pedagogy is the method and practice of teaching, especially for teaching an academic subject or theoretical concept". In addition to conventional time-tested lecture method, the institute will emphasize on experiential learning:

Role Play & Simulation: Role- play and simulation are forms of experiential learning. Learners take on different roles, assuming a profile of a character or personality, and interact and participate in diverse and complex learning settings. Role-play and simulation function as learning tools for teams and groups or individuals as they "play" online or face-to-face. They alter the power ratios in teaching and learning relationships between students and educators, as students learn through their explorations and the viewpoints of the character or personality they are articulating in the environment. This student-centered space can enable learner-oriented assessment, where the design of the task is created for active student learning. Therefore, role-play& simulation exercises such as virtual share trading, marketing simulation etc. are being promoted for the practical-based experiential learning of our students.

Video Based Learning (VBL) & Learning through Movies (LTM): These days technology has taken a front seat and classrooms are well equipped with equipment and gadgets. Video-based learning has become anindispensable part of learning. Similarly, students can learn various concepts through movies. In fact, many teachers give

examples from movies during their discourses. Making students learn few important theoretical concepts through VBL & LTM is a good idea and method. The learning becomes really interesting and easy as videos add life to concepts and make the learning engaging and effective. Therefore, our institute is promoting VBL & LTM, wherever possible.

Field/Live Projects: The students, who take up experiential projects in companies, where senior executives with a stake in teaching guide them, drive the learning. All students are encouraged to do some live project other their regular classes.

Industrial Visits: Industrial visit are essential to give students hand-on exposure and experience of how things and processes work in industries. Our institute organizes such visits to enhance students' exposure to practical learning and work out for a report of such a visit relating to their specific topic, course or even domain.

MOOCs: Students may earn credits by passing MOOCs as decided by the college. Graduate level programs may award Honors degree provided students earn pre-requisite credits through MOOCs. University allows students toundertake additional subjects/course(s) (In-house offered by the university through collaborative efforts or courses in the open domain by various internationally recognized universities) and to earn additional credits on successful completion of the same. Each course will be approved in advance by the University following the standard procedure of approval and will be granted credits as per the approval. Keeping this in mind, University proposed and allowed a maximum of two credits to be allocated for each MOOC courses. In the pilot phase it is proposed that a student undertaking and successfully completing a MOOC course through only NPTEL could be given 2 credits for each MOOC course.

For smooth functioning and monitoring of the scheme the following shall be the guidelines for MOOC courses, Add-on courses carried out by the College from time to time.

a) It will necessary for every student to take at least one MOOC Course throughout the programme.
b) There shall be a MOOC co-ordination committee in the College with a faculty at the level of Professor heading the committee and all Heads of the Department being members of the Committee.
c) The Committee will list out courses to be offered during the semester, which could be requested by the department or the students and after deliberating on all courses finalize a list of courses to be offered with 2 credits defined for each course and the mode of credit consideration of the student. The complete process shall be obtained by the College before end of June and end of December for Odd and Even semester respectively of the year in which the course is being offered. In case of MOOC course, the approval will be valid only for the semester on offer.
d) Students will register for the course and the details of the students enrolling under the course along with the approval of the Vice Chancellor will be forwarded to the Examination department within fifteen days of start of the semester by the Coordinator MOOC through the Principal of the College.
e) After completion of MOOC course, Student will submit the photo copy of Completion certificate of MOOC Course to the Examination cell as proof.

f) Marks will be considered which is mentioned on Completion certificate of MOOC Course.

g) College will consider the credits only in case a student fails to secure minimum required credits then the additional subject(s) shall be counted for calculating the minimum credits required for the award of degree.

Special Guest Lectures (SGL) & Extra Mural Lectures (EML): Some topics/concepts need extra attention and efforts as they either may be high in difficulty level or requires experts from specific industry/domain to make things/concepts clear for a better understanding from the perspective of the industry. Hence, to cater to the present needs of industry we organize such lectures, as part of lecture-series and invite prominent personalities from academia and industry from time to time to deliver their vital inputs and insights.

Student Development Programs (SDP): Harnessing and developing the right talent for the right industry anoverall development of a student is required. Apart from the curriculum teaching various student development programs (training programs) relating to soft skills, interview skills, SAP, Advanced excel training etc. that may be required as per the need of the student and industry trends, are conducted across the whole program. Participation in such programs is solicited through volunteering and consensus.

Industry Focused programmes: Establishing collaborations with various industry partners to deliver the programme on sharing basis. The specific courses are to be delivered by industry experts to provide practice-based insight to the students.

Special assistance program for slowlearners &fast learners: write the note how would you identify slow learners, develop the mechanism to correcting knowledge gap. Terms of advance topics what learning challenging it will be provided to the fast learners.

Induction program: Every year 3 weeks induction program is organized for 1st year students and senior students to make them familiarize with the entire academic environment of university including Curriculum, Classrooms, Labs, Faculty/ Staff members, Academic calendar and various activities.

Mentoring scheme: There is Mentor-Mentee system. One mentor lecture is provided per week in a class. Students can discuss their problems with mentor who is necessarily a teaching faculty. In this way, student's problems or issues can be identified and resolved.

Competitive exam preparation: Students are provided with one class in every week for GATE/ Competitive exams preparation.

Extra-curricular Activities: Organizing & participation in extracurricular activities will be mandatory to help students develop confidence & face audience boldly. It brings out their leadership qualities along with planning

& organizing skills. Students undertake various cultural, sports and other competitive activities within and outside then campus. This helps them build their wholesome personality.

Career & Personal Counseling: Identifies the problem of student as early as possible and gives time to discuss their problems individually as well as with the parents. Counseling enables the students to focus on behavior and feelings with a goal to facilitate positive change. Its major role lies in giving: Advice, Help, Support, Tips, Assistance, and Guidance.

Participation in Flip Classes, Project based Learning (A2 Assignment), Workshops, Seminars &writing & Presenting Papers: Departments plan to organize the Flip Classes, Project based Learning (A2 Assignment), workshops, Seminars & Guest lecturers time to time on their respective topics as per academic calendar. Students must have to attend these programs. This participation would be count in the marks of general Discipline & General Proficiency which is the part of course scheme as non-credit course.

Formation of Student Clubs, Membership & Organizing & Participating events: Every department has the departmental clubs with the specific club's name. The entire student's activity would be performed by the club. One faculty would be the coordinator of the student clubs & students would be the members with different responsibility.

Capability Enhancement & Development Schemes: The Institute has these schemes to enhance the capability and holistic development of the students. Following measures/ initiatives are taken up from time to time for the same: Career Counseling, Soft skill development, Remedial Coaching, Bridge Course, Language Lab, Yoga and Meditation, Personal Counseling

Library Visit & Utilization of QLRC: Students may visit the library from morning 10 AM to evening 8 PM. Library created its resources Database and provided Online Public Access Catalogue (OPAC) through which users can be accessed from any of the computer connected in the LAN can know the status of the book. Now we are in process to move from OPAC to KOHA.

Detailed Syllabus (Semester wise /course wise)

SEMESTER 1

MA3102	Title: Mathematics I	L T P C 3 2 0 4
Version No.	2.0	
Course Prerequisites	Nil	
Objectives	To provide the requisite and relevant background necessary to understand engineering courses.	
Expected Outcome	Students will be able to solve applied problems using calculus and also learn to demonstrate matrix facility.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Matrix Algebra	8
Rank, Solution of linear simultaneous equations. Eigen-values and Eigenvectors of a matrix: Symmetric, Skew-symmetric, Hermitian, Skew-Hermitian, Orthogonal & Unitary matrices and their properties; Cayley- Hamilton theorem, Diagonalization of a matrix.		
Unit II	Multivariable Calculus	6
Functions of two variables, limits and continuity, Partial derivatives, Approximation of Error,EulersTheorem,Total differential, Taylor's expansion for two variables, Maxima and Minima, Constrained maxima and minima, Lagrange's multiplier method, Jacobeans.		
Unit III	Multiple Integral	8
Review of curve tracing and quadric surfaces, Double and Triple integrals, Change of order of integration. Change of variables. Application of Double integration and triple integration, Gamma and Beta functions. Dirichlet's integral.		
Unit IV	Ordinary Differential Equation	8
Review of Ordinary differential equation of first order and first degree, Exact differential Equation, Solution of second and higher order differential equations with constant coefficients (operation method).		
Unit V	Vector Calculus	6
Differentiation of vectors, Scalar and vector point function. Normal and Directional derivative gradient, divergence, curl and their physical meaning. Line and surface integrals. Green's, Gauss and Stroke's theorem and their applications.		
Text Books	1. R.K. Jain and S.R.K. Iyenger, Advanced Engineering Mathematics, Narosa Publishing House.	
Reference Books	1. E. Kreyszig, Advanced Engineering Mathematics, John Wiley and Sons, Inc., U.K. 2. M.D. Weir, J. Hass, F.R. Giordano, Thomas' Calculus, PearsonEducation.	
Mode of Evaluation	Internal and External	
Recommendation by Board of Studies on	28-05-2022	

Date of approval by the Academic Council	20/10/2022

Course Outcome for MA3102

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to learn the basic principles of multi-variable calculus with their proofs. They should be able to classify partial differential equations and transform them into canonical form. They will also understand how to extract information from partial derivative models in order to interpret reality.	2	Em
CO2	Students should be able to understand and learn how to find the area and volume of any region and solid body respectively by integral and also find the moments of inertia for a thin plate in plane.	2	S
CO3	Students should be able to understand theorems related to directional derivative of gradient and reproduce its proof. They should be able to Explain the concept of a vector integration in a plane and in space.	2	S
CO4	Students should be able to know basic application problems described by second order linear differential equations with constant coefficients. They should be also able to understand and solve the applications associated with Laplace Transform.	2	En
CO5	Students should be able to solve the linear equations using matrix properties and Determine characteristic equation, Eigen values, eigenvectors and diagonalizable of a matrix.	1	None

CO-PO Mapping for MA3102

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	1	1	1	3	2	1	2	3	1	2	1	2	2
CO 2	3	3	2	3	3	3	2	3	1	3	3	1	1	3
CO 3	2	3	2	2	1	1	3	1	1	2	2	3	2	3
CO 4	2	3	3	3	3	3	3	2	2	2	2	3	1	1

CO 5	3	2	2	2	3	2	1	2	2	2	2	2	1	3
Avg.	2.6	2.4	2	2.2	2.6	2.2	2	2	1.8	2	2.2	2	1.4	2.4

PS3101	**Title:Human Values and Ethics**	**L T P C** **2 0 0 2**
Version No.	**1.0**	
Course Prerequisites	Nil	
Objectives	To facilitate the development of a holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the human reality and the rest of existence	
Expected Outcome	This course will make the students aware and sensitive to value systems in real life situations. It will help them to discriminate between ephemeral and eternal value and to discriminate between essence and form	
Unit No.	**Unit Title**	**No. of hours (per Unit)**
Unit I	**Introduction of Value Education**	5
1. Understanding the need, basic guidelines, content and process of Value Education 2. A look at basic Human Aspirations: Self Exploration–its content and process		
Unit II	**Understanding Harmony - Harmony in Myself!**	5
1. Thoughtful human being in harmony; as a co-existence of the sentient, attitude and its importance in relationship. 2. Understanding the needs, characteristics and activities of Self ('I')		
Unit III	**Understanding Harmony in the Family and Society**	5
1. Harmony in the family; values in human relationships; meaning of Nyaya , Trust (Vishwas) and Respect (Samman) as the foundation values of relationships. 2. Harmony in society:Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals.		
Unit IV	**Understanding Harmony in the Nature and Existence**	4
1. Understanding the harmony in Nature: Interconnectedness among the four orders of nature- recyclability and self-regulation in nature 2. Natural perception of harmony at all levels of existence		
Unit V	**Understanding Professional Ethics**	5
1. Competencies in professional ethics: a) Ability to utilize the professional competence for augmenting universal human order b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, c) Ability to identify and develop appropriate technologies and management patterns for above production Systems.		
Text Books	1. R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and Professional Ethics, Excel books, New Delhi	
Reference Books	1. A.N. Tripathy, Human Values, New Age International Publishers 2. B L Bajpai, Indian Ethos and Modern Management, New Royal Book Co., Lucknow 2. B P Banerjee, Foundations of Ethics and Management, Excel Books	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by the Academic Council	20/10/2022	

Course Outcome for PS3101

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to understand the significance of value inputs in a classroom, distinguish between values and skills, understand the need, basic guidelines, content and process of value education, explore the meaning of happiness and prosperity and do a correct appraisal of the current scenario in the society.	2	Em
CO2	Students should be able to distinguish between the Self and the Body, understand the meaning of Harmony in the Self the Co-existence of Self and Body.	2	S
CO3	Students should be able to understand the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human-human relationships and explore their role in ensuring a harmonious society.	2	S
CO4	Students should be able to understand the harmony in nature and existence, and work out their mutually fulfilling participation in the nature.	2	En
CO5	Students should be able to distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.	1	None

CO-PO Mapping for PS3101

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	2	3	3	2	2	3	1	1	1	3	3	1	3
CO 2	2	2	3	2	3	3	1	2	1	1	1	3	3	2
CO 3	3	3	1	1	1	2	2	1	2	1	1	2	3	2
CO 4	1	1	3	2	2	2	2	1	2	3	2	2	2	1
CO 5	2	1	2	2	2	1	2	2	1	3	3	2	3	1
Avg.	2	1.8	2.4	2	2	2	2	1.4	1.4	1.8	2	2.4	2.4	1.8

CS3103	Title:Basics of Computer and C Programming	L T P C 4 0 0 4
Version No.	2.0	
Course Prerequisites	Nil	
Objective	This subjects aims to make student handy with the computers basics and programming.	
Expected Outcome	On completion of subject the students will be able to apply fundamental of Computers, Architecture of Computer, Arithmetic of Computer, Basics of Computer Programming	
Unit No.	Unit Title	No. of Hrs (Per Unit)
Unit I	Architecture and Arithmetic of Computer	10
Design of Computer Hardware Design, Number System [Decimal, Binary, Octal, Hexadecimal], Conversions, Binary Arithmetic [Addition, Subtraction, Multiplication, Division, 1s Compliment, 2s Compliment], Floating Point Arithmetic [IEEE 754 Concept, Storage of Floating Point Numbers]		
Unit II	Basics of C Programming	10
Algorithms, Flow Chart, Types of Computer Languages:-Machine Language, Assembly Language and High Level Language, Concept of Compiler, Assembler, Linker and Loader. Fundamental Data Type: int, float, char and void. Qualifier for int (long and short), singed and unsigned numbers. Storage Classes: auto, static, extern and register, Operators: Arithmetic, Relational, Conditional and Logical.. Precedence vs. Associativity. Fundamentals of C programming: Writing and executing the first C program, conditional execution, Iterations [Loops], switch-case idea [switch, case, break, default], continue statements.		
Unit III	Programming Elements	9
Iteration (Loop): for, while and do-while, nested of loops, break and continue. Function: What is a Function? , Passing Values between Functions, Stack Handling of function. Recursion: Introduction, Stack Handling of recursion, Practice Programs. Pointer: Introduction, Pointer [Declaration, Initialization and Access], Call by [Value; Reference].		
Unit IV	Arrays, Preprocessors and Strings	9
Arrays: Array, Declaration & Initialization Array, Passing an Array to a Function. 2-D Arrays: Declaration; Initializing. Passing 2-D array to a Function, Array of Pointers, and 3-D Array. Preprocessor: C Preprocessor: Features, Macro Expansion, Macros with Arguments, File Inclusion, #if, #else, #endif, #define, #undef, #ifdef, #ifndef, #elif, #undef, #error, #pragma. String: Concept of char vs. int, Concept of Strings, String Handling Functions Introduction and Implementation [strlen(), strcpy(), strcat(), strcmp(), strlwr(), strupr()], Some more Functions [strncpy(), strncat(), strncmp(), gets(), puts()]		
Unit V	Structure, Enums and File Handling	10
Structures: Structures (What & Why?), Declaring & Accessing Structure, Logical Storage vs. Actual Storage, Passing Structure to a Function, Structure and Pointer, Application of Structure.Operator, Union &Enum: Operations On Bits, One's Complement Operator, Bitwise Operators (<<, >>, ~, &, |, ^), Union, Union Vs. Structure, Enumerated Data Type & Its Use.File Handling: Concept of File, Types of File, Meaning of File Handling, FILE macro & its respective header file, File Handling Functions [fopen(), fclose(), fgetc(), fputc(), fgets(), fputs(), fscanf(), fprintf(), fread(), fwrite(),fseek() [Macro Explanation : SEEK_SET, SEEK_CUR, SEEK_END], ftell(), rewind(), getw(), putw()].		
Text Books	1. "Mastering C" by KR Venugopal 2. "Let us C" by Y. kanetkar 3. "Programming in ANSI C" by E. Balagurusamy.	

Reference Books	1. Kernighan,B.W and Ritchie,D.M, "The C Programming language", Pearson Education 2. 2. Byron S Gottfried, " Programming with C", Schaum's Outlines Tata McGraw-Hill
Mode of Evaluation	Internal and External Examinations
Recommended by Board of Studied on	28-05-2022
Date of Approval by the Academic Council on	20/10/2022

Course Outcome for CS3101

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to approachthe programming tasks using techniques learned in Theory and write pseudo-codes based on the requirements of the problem.	2	Em
CO2	Students should be able to usethe comparisons and limitations of the various programming constructs and choosethe right one for the task in hand.	2	S
CO3	Students should be able to write the program based on numerical techniques learned and able to edit, compile, debug, correct, recompile and run it.	2	S
CO4	Develops the knowledge of different software on different Operating System Platform such as Linux/Windows (Open Source and Licensed) with understanding of different IDE	2	En
CO5	Makes students gain a broad perspective about the uses of computers in engineering industry	1	None

CO-PO Mapping for CS3101

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	2	3	2	3	3	3	1	1	3	3	2	1	2
CO 2	3	2	1	2	3	2	1	1	1	1	1	2	2	3
CO 3	3	1	1	2	1	2	2	2	2	1	1	3	2	2
CO 4	2	1	2	3	3	3	3	1	3	1	2	3	2	1
CO 5	1	3	2	3	1	1	2	1	2	1	1	2	2	1

Avg.	2.2	1.8	1.8	2.4	2.2	2.2	2.2	1.2	1.8	1.4	1.6	2.4	1.8	1.8

EC3101	**Title: Basic Electrical and Electronics Engineering**	**L T P C** **3 0 0 3**
Version No.	**1.1**	
Course Prerequisites	Nil	
Objectives	To provide an overview of electrical and electronics fundamentals.	
Expected Outcome	The student would acquire the knowledge of basics fundamentamentals of electrical and electronics.	
Unit No.	**Unit Title**	**No. of hours (per Unit)**
Unit I	**Basic Concepts of Electrical Engineering**	7
Electric Current, Electromotive force, Electric Power, Ohm's Law, Basic Circuit Components, Faraday's Law of Electromagnetic Induction, Lenz's Law, Kirchhoff's laws, Network Sources, Resistive Networks, Series-Parallel Circuits, Node Voltage Method, Mesh Current Method. Superposition, Thevenin's, Norton's and Maximum Power Transfer Theorems.		
Unit II	**Alternating Quantities**	7
Alternating Quantities: Introduction, Generation of AC Voltages, Root Mean Square and Average Value of Alternating Currents and Voltages, Form Factor and Peak Factor, Pharos Representation of Alternating Quantities, Single Phase RLC Circuits, Introduction to 3-Phase AC System.		
Unit III	**Transformers**	8
Transformers: Construction, EMF equation, ratings, pharos diagram on no load and full load, equivalent circuit, regulation and efficiency calculations, open and short circuit tests, auto-transformers.		
Unit IV	**Basic Electronics**	7
Conduction in Semiconductors, Conduction Properties of Semiconductor Diodes, Behavior of PN Junction, PN Junction Diode, Zener Diode, Photovoltaic Cell, Rectifiers, Bipolar Junction Transistor, Field Effect Transistor, Transistor as an Amplifier.		
Unit V	**Digital Electronics and Electrical Measuring Instruments**	7
Digital Electronics: Boolean algebra, Binary System, Logic Gates and Their Truth Tables.Kaurnugh Map, Electrical Measuring Instruments: Basic OP-AMP, Differential amplifier, PMMC instruments, shunt and series multipliers, multimeters, Moving iron ammeters and voltmeters, dynamometer, wattmeter, AC watthour meter, extension of instrument ranges.		
Text Books	1. V. Jagathesan, K. Vinod Kumar & R. SaravanKumar,Basic Electrical & Electronics Engineering Wiley India. 2. Sukhija and Nagsarkar,Basic Electrical and Electronics Engineering Oxford Publication	
Reference Books	1. Kothari, Nagrath,Basic Electrical & Electronics Engineering TMH 2. Prasad Sivanagraju,Basic Electrical & Electronics EngineeringCengage learning Indian Edition 3. Muthusubrmaniam,Basic Electrical and Electronics Engineering by TMH	
Mode of Evaluation	Internal and External Examinations.	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by	20/10/2022	

the Academic Council	

Course Outcome for EC3101

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to understand the basic theorems used in simplifying the electrical circuits.	2	Em
CO2	Students should be able to Know about the generation and utilization of three phase alternating quantities.	2	S
CO3	Students should be able to Know about single phase transformer and its various parameters.	2	S
CO4	Students should be able to understand the various components used in electronics like P-N junction and Zenerdioide.	2	En
CO5	Students should be able to understand basics of digital electronics and various electrical measurement devices.	1	None

CO-PO Mapping for EC3101

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	2	1	1	3	2	1	2	1	1	3	1	2	1
CO 2	3	3	2	3	3	2	3	2	1	1	3	3	2	1
CO 3	2	2	2	2	2	3	2	2	2	2	1	2	2	1
CO 4	1	1	1	2	2	1	3	2	2	3	2	2	3	3
CO 5	2	2	3	3	2	3	1	3	1	2	3	3	1	3
Avg.	2.2	2	1.8	2.2	2.4	2.2	2	2.2	1.4	1.8	2.4	2.2	2	1.8

CS3140	Title: Basics of Computer and C Programming Lab	L T P C 0 0 2 1
Version No.	1.1	
Course Prerequisites	Nil	
Objectives	Learning objectives is to improve confidence in technology use and increased awareness of opportunities afforded to individuals with computer application skills.	
Expected Outcome	Recognize basic computer hardware architecture constructs such as instructions sets, memory, CPU, external devices, and data representation	

List of Experiments

1. Programs using I/O statements and expressions.
2. Programs using decision-making constructs.
3. Write a program to find whether the given year is leap year or Not? (Hint: not every centurion year is a leap. For example 1700, 1800 and 1900 is not a leap year)
4. Design a calculator to perform the operations, namely, addition, subtraction, multiplication, division and square of a number.
5. Check whether a given number is Armstrong number or not?
6. Populate an array with height of persons and find how many persons are above the average height.
7. Populate a two dimensional array with height and weight of persons and compute the Body Mass Index of the individuals.
8. Convert the given decimal number into binary, octal and hexadecimal numbers using user defined functions.
9. From a given paragraph perform the following using built-in functions:
   a. Find the total number of words.
   b. Capitalize the first word of each sentence.
   c. Replace a given word with another word.
10. Solve towers of Hanoi using recursion.
11. Sort the list of numbers using pass by reference.
12. Generate salary slip of employees using structures and pointers.
13. Compute internal marks of students for five different subjects using structures and functions.
14. Insert, update, delete and append telephone details of an individual or a company into a telephone directory using random access file.

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	28-05-2022
Date of approval by the Academic Council	20/10/2022

Course Outcome for CS3140

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to approachthe programming tasks using techniques learned in Theory and write pseudo-codes based on the requirements of the problem.	2	Em
CO2	Students should be able to usethe comparisons and limitations of the various programming constructs and choosethe right one for the task in hand.	2	S
CO3	Students should be able to write the program based on numerical techniques learned and able to edit, compile, debug, correct, recompile and run it.	2	S

CO-PO Mapping for CS3140

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	2	1	3	1	1	3	3	3	1	1	3	3	1
CO 2	2	1	1	1	3	3	3	1	1	2	3	3	1	1
CO 3	2	3	1	2	1	2	3	3	3	2	2	2	3	2
Avg.	2.3	2	1	2	1.6	2	3	2.3	2.3	1.6	2	2.6	2.3	1.3

EC3140	Title:Basic Electrical and Electronics Engineering lab	L T P C 0 0 3 2
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To make students familiar with the fundamental laws featuring in the field of Electrical and Electronics Engineering.	
Expected Outcome	Students shall conceptualize and firmly grasp the basic electrical and electronics engineering laws along with the knowledge of fundamental circuits governing the functioning of important devices.	

List of Experiments

1. To verify the Kirchhoff's current and voltage laws.
2. To verify the Superposition theorem.
3. To verify the Thevenin's theorem.
4. To verify the Norton's theorem.
5. To verify the maximum power transfer theorem.
6. To study the V-I characteristics of p-n junction diode.
7. To study the diode as clipper and clamper.
8. To study the half-wave and full-wave rectifier using silicon diode.
9. To study transistor in Common Base configuration and plot its input/output characteristics.
10. To study various logic gates and verify their truth tables.

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	28-05-2022
Date of approval by the Academic Council	20/10/2022

Course Outcome for EC3140

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to know about the basic concepts of the Kirchhoff's current and voltage laws and perform Thevenin's, Norton's, and superposition and maximum power transfer theorems.	2	Em
CO2	Students should be able to analyze and understand the characteristics of transistors and semiconductor diodes and analyze the half-wave and full-wave rectifier using silicon diode.	2	S
CO3	Students should be able to Learn the basic concepts of various logic gates.	2	S

CO-PO Mapping for EC3140

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	2	1	2	1	3	1	3	2	2	3	2	3	1
CO 2	2	1	1	1	3	3	3	3	3	1	1	1	1	3
CO 3	2	3	3	2	3	2	2	3	2	3	3	3	3	2
Avg.	2	2	1.7	1.7	2.3	2.7	2	3	2.3	2	2.3	2	2.3	2

ME3142	Title: Engineering Graphics and Design	L T P C 0 0 4 2
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To enable students to acquire and use engineering drawing skills as a means of accurately and clearly communicating ideas, information and instructions through drafting exercises.	
Expected Outcome	To know and understand the conventions and the methods of engineering drawing. To improve their visualization skills so that they can apply these skills in developing new products. Able to draw projection of lines, planes, solids in different positions.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Introduction, Projection of Points, Projection of Straight Lines	12
Introduction to Engineering Equipment's, Elements of Engineering Drawing, dimensioning, Types of Lines, Various types of projections, First and third angle systems of orthographic projections. Projections of points in different quadrants. Projection of Lines.		
Unit II	Projection of Planes	8
Introduction, types of planes, Projection of planes by change of position method only, projection of plane perpendicular to a plane, with axis parallel to both planes, with axis parallel to one plane and inclined to the other plane.		
Unit III	Projection and section of Solids	12
Types of solids, Projections of solid in different axis orientations. Introduction - section planes - apparent section - true section - sectional view - need for sectional view - cutting plane - cutting plane line. Sectional view of simple solids. Section plane perpendicular to one plane and parallel to the other, section plane perpendicular to one plane and inclined to the other.		
Unit IV	Development of Surfaces, Orthographic views (First Angle Projection Only)	8
Development of surface of various solids in simple positions, Three orthographic views of solids.		
Unit V	Computer aided Drafting	8
Demonstration knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; knowing and use of various commands to draw 2D objects.		
Text Books	1 N.D. Bhatt and V.M.Panchal, Engineering Drawing: Plane and Solid Geometry, Charotar Publishing House	
Reference Books	1. Amar Pathak, Engineering Drawing, Dreamtech Press, New Delhi 2. T. Jeyapoovan, Engineering Graphics using AUTOCAD 2000, Vikas Publishing House 3. Thomas E.French, Charles J.Vierck, Robert J.Foster, Engineering Drawing and Graphic Technology, McGraw Hill International Editions 4. P.S. Gill, Engineering Graphics and Drafting, S.K. Kataria and Sons	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by the Academic Council	20/10/2022	

Course Outcome for ME3141

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students will be able to know about basic concepts of projection and To Draw the projection of points and lines located in different quadrants	2	Em
CO2	Students will be able to Draw the projection of plane surfaces in various positions	2	S
CO3	Students will be able to Draw the projection of solids in various positions	2	S
CO4	Students will be able to Draw sectional views of a given object	2	En
CO5	Students will be able to develop surfaces and draw orthographic view of given object	1	None

CO-PO Mapping for ME3141

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	2	3	1	1	2	1	1	2	1	1	1	1	3
CO 2	2	2	3	1	1	1	3	1	2	1	2	1	2	3
CO 3	2	2	2	1	3	2	2	3	2	2	2	1	1	3
CO 4	1	1	1	1	3	1	1	1	2	1	2	1	2	3
CO 5	1	1	1	3	3	3	3	3	3	1	2	3	2	3
Avg.	1.8	1.6	2	1.4	2.2	1.8	2	1.8	2.2	1.2	1.8	1.4	1.6	3

VP3101	Title:Communication and Soft Skills-I	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	VP3101	
Objectives	• To develop the English communication skills of our students. • To enable them to communicate effectively and nurture their speaking skills in English. • To inculcate in our students the ability to develop soft skills and professional etiquettes which will make them more suitable for jobs in the corporate sector. • To overcome interaction phobia as English is not their mother tongue.	
Expected Outcome	• After the Course the students will be able to write/understand and create sentences in English of all tenses. • They will be able to take part in daily routine conversations in English. • Students will be able to understand and be partially groomed in corporate etiquettes and culture	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Personality Development	2
• Meaning of Personality Development, importance, Determinants of Personality Development, Maslow's need • hierarchy theory		
Unit II	Communication Skills	8
• Introduction, Communication skills, Listening skills, Speaking skills, Speaking skills 1:Vocabulary games, story • telling, just a minute, volte face • speaking skills • Speaking skills 2: Short speech, Role-Play, Face-Off • Speaking skills 3- Group discussion, debate, presentations		
Unit III	Reading Skills	2
• Passage reading, newspaper, success story, passage,		
Unit IV	Self-management skills	8
• Self-management skills: Goal setting setting,SWOT analysis, Self-motivation • Body language: gestures & postures, Fcaial Expressions,Physical appearance • Soft skills: leadership skills,Team work • Interpersonal Skills: Image building skills,Interpersonal skills		
Unit V	Writing Skills	2
Writing letter,E-mail etiquettes, Applications,Project writing, invitations, Resume writing		
Text Books	1. High School Grammar by Wren & Martin revised by Dr. N.D.V.Prasada Rao (S.Chand) 2. Personality development by Harold R. Wallace (Cengage Learning)	
Reference Books	1. Essential English grammar by Raymond Murphy (Cambridge Univ. Press) 2. Practical English Usage by Michael Swan (Oxford) 3. Personality Development & Soft skills by Barun K. Mitra; 2nd edition (Oxford Univ. Press) 4. **Online Resources:** Flipboard, TEDx, Youtube	

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	28-05-2022
Date of approval by the Academic Council	20/10/2022

Course Outcome for VP3101

Course code	**VP3101**
Paper Title	**Communication and Soft Skills-I**
CO1	On the completion of course the Students will be able to write, understand, analyze and create sentences in professional language (English). Students' horizon will be expanded with the correct usage of Grammar in writing and speaking, and will be able to improvise their speaking ability.
CO2	Students will be able to take part in daily routine conversation in English
CO3	Students will be able to understand and partially be groomed in corporate etiquettes and culture
CO4	This course will aid the students to learn words and form strong vocabulary, use them correctly in a sentence while speaking and writing. Moreover, understand their meaning in the text
CO5	The Students will learn to use strategies to listen actively and able to distinguish more important ideas from less important ones. Implement them while participating in the discussions. Henceforth, It yields the improvement in understanding, analyzing, creating and implementing the learning into real world encounter, effectively.

SEMESTER 2

MA3202	Title:MathematicsII	L T P C 3 2 04
Version No.	1.0	
Course Prerequisites	MA3102	
Objectives	This course is designed to give a comprehensive coverage at an introductory level to the subject of Partial Differential Equations, Numerical and Statistical Techniques.	
Expected Outcome	Students will be familiar with various methods that lead to solve ODEs and PDEs; and will also be able to analyze and interpret statistical data.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Partial Differential Equations	8
Introduction to Partial differential equations, Linear partial differential equations with constant coefficients of second order. Method of separation of Variables for solving PDE, One dimensional wave equation, Laplace equation in two-dimensions, Heat conduction equations of one dimension.		
Unit II	Fourier series	6
Trigonometric Fourier series and its convergence. Fourier series of even and odd functions. Fourier half-range series.		
Unit III	Numerical Methods	6
Solution of transcendental and algebraic equations: Bisection method, Regula False method, Newton-Raphson method; Solution of system of linear equations: LU-decomposition method, Jaccobi method, Gauss-Seidel method.		
Unit IV	Interpolation	7
Interpolation: difference tables, Newton formulae, Lagrange interpolation and Newton's divided difference interpolation. Numerical integration: Trapezoidal, Simpsons 1/3rd and 3/8th rules,Solution of first and second order ordinary differential equations: Euler, Modified Euler, Runge-KuttaMethodof fourth order.		
Unit V	Complex Variable, Probability and Distributions	9
Analytic functions; Cauchy-Riemann equations; Cauchy's integral theorem and integral formula; Taylor and Laurent series. Probability and Statistics: Definitions of probability, conditional probability; mean, median, mode and standard deviation; Random variables, Binomial, Poisson and Normal distributions.		
Text Books	1. R.K. Jain and S.R.K. Iyenger, Advanced Engineering Mathematics, Narosa Publishing House.	
Reference Books	1. E. Kreyszig, Advanced Engineering Mathematics, JohnWiley and Sons, Inc., U.K. 2. M.D. Weir, J. Hass, F.R. Giordano, Thomas' Calculus, Pearson Education.	
Mode of Evaluation	Internal and External	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by the Academic Council	20/10/2022	

Course Outcome forMA3201

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to understand ordinary differential equations, with their solutions through constant coefficients. They will also learn about Euler-Cauchy equations, Solution of second order differential equations by changing dependent and independent variables.	2	Em
CO2	Students should be able to understand the properties of Fourier series. And the relationship between Fourier series and linear time invariant system.	2	S
CO3	Students should be able to learn the basics of the theory of error and the approximation theory; the fundamental principles of mathematical modeling; the numerical methods for solving problems of algebra; and the methods of numerical integration and differentiation.	2	S
CO4	Students should be able to learn about Interpolation which is a useful mathematical and statistical tool used to estimate values between two points.	2	En
CO5	Students should be able to formulate and solve problems involving random variables and apply statistical methods for analyzing experimental data. They will also learn to analyze the complex function with reference to their analyticity, integration using Cauchy's integral and residue theorems. Taylor's and Laurent's series expansions of complex function will be also explored at the end of Unit.	1	None

CO-PO Mapping for MA3201

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	1	3	3	1	2	3	1	1	3	2	1	1	2	2
CO 2	3	3	1	3	1	1	3	1	1	2	1	1	2	1
CO 3	2	3	2	1	1	1	3	1	3	3	3	1	3	3
CO 4	2	2	2	3	3	3	2	2	1	3	1	2	3	2
CO 5	1	2	3	1	1	3	1	1	2	1	3	1	1	1

Avg.	1.8	2.6	2.2	1.8	1.6	2.2	2	1.2	2	2.2	1.8	1.2	2.2	1.8

PH3101	**Title: Engineering Physics**	**L T P C** **3 1 0 4**
Version No.	**1.0**	
Course Prerequisites	Nil	
Objectives	Students will be able to understand the basic of classical and modern physics and quantum mechanics and electromagnetic concepts with basic knowledge of optics.	
Expected Outcome	Will have the ability to Analyze the intensity variation of light due to Polarization, interference and diffraction. Will also be able to explain working principle of lasers and Explain fundamentals of quantum mechanics.	
Unit No.	**Unit Title**	**No. of hours (per Unit)**
Unit I	**Relativistic Mechanics**	5
Inertial and Non-inertial Frames, Postulates of Special Theory of Relativity, Galilean and Lorentz Transformation, Length Contraction and Time Dilation, Addition of Velocities, Mass Energy Equivalence and Variation of Mass with Velocity.		
Unit II	**Interference and Diffraction**	5
Coherent Sources, Conditions of Interference; Young's double slit experiment, Interference in thin films – Wedge Shaped Film, Newton's Rings. Diffraction: Single Slit Diffraction, Diffraction Grating, Raleigh's Criterion of Resolution, and Resolving Power of Grating.		
Unit III	**Polarization and Laser**	5
Phenomenon of Double Refraction, Ordinary and Extra-ordinary Rays, NicolPrism; Polarization: Malus law, Brewster's law;Production and Analysis of Plane, Circularly and Elliptically Polarized Light. Laser**:** Principle of Laser Action, Einstein's Coefficients, Construction and Working of He-Ne and Ruby Laser.		
Unit IV	**Electromagnetic Properties of Materials**	5
Ampere's Law and Displacement Current, Maxwell's Equations in Integral and Differential Forms, Electromagnetic Wave Propagation in Free Space and Conducting Media, PointingTheorem.		
Unit V	**Wave Mechanics**	4
Wave Particle Duality, de Broglie Concept of Matter Waves, Heisenberg Uncertainty Principle and its applications, Schrödinger Wave Equation and Its Applications: Particle in a Box (one dimensional only).		
Text Books	1. Beiser, Concepts of Modern Physics, McGraw Hill 2. Dr Amit Dixit, Engineering Physics, Nano Edge Publicatons	
Reference Books	1. Robert Resnick, Introduction to Special theory of Relativity, Wiley 2. AjoyGhatak, Optics, TMH 3. David J. Griffith, Introduction to Electrodynamics, PHI 4. William Hayt, Engineering Electromagnetics, TMH	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by the Academic Council	20/10/2022	

Course Outcome for PH3101

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to understand special theory of relativity (STR), concepts linked with STR and radiation laws.	2	Em
CO2	Students should be able to understand interference, diffraction and able to connect it to a few engineering applications.	2	S
CO3	Students should be able to explain the phenomena of polarization in electromagnetic waves and their production, Detection and analysis. They will also understand the operation and working principle of laser.	2	S
CO4	Students should be able to understand electromagnetic theory using Maxwell's equations, and its uses in various engineering application. They will also understand the difference between diameter, para and ferromagnetic materials.	2	En
CO5	Students should be able to explain fundamentals of quantum mechanics and apply it to problems on bound states.	1	None

CO-PO Mapping for PH3101

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	1	2	1	1	2	1	1	2	2	2	1	1	1
CO 2	2	1	1	2	2	2	2	1	3	1	3	3	1	1
CO 3	1	1	2	1	1	2	1	2	3	2	2	2	1	3
CO 4	1	3	3	1	1	3	2	2	2	1	1	3	1	1
CO 5	2	1	2	1	2	3	1	3	1	3	2	2	2	2

Avg.	1.6	1.4	2	1.2	1.4	2.4	1.4	1.8	2.2	1.8	2	2.2	1.2	1.6

CY3205	Title: Environmental Studies	L T P C 2 0 0 2
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	Creating awareness among engineering students about the importance of environment, the effect of technology on the environment and ecological balance is the prime aim of the course.	
Expected Outcome	Students will understand the transnational character of environmental problems and ways of addressing them, including interactions across local to global scales.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Introduction to Environmental studies and Ecosystems	5
Multidisciplinary nature of environmental studies, Scope and importance, Need for public awareness. Concept, Structure and function of an ecosystem, Energy flow in an ecosystem: food chains, food webs and ecological pyramids. Examples of various ecosystems such as: Forest, Grassland, Desert, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries), Producers, consumers and decomposers. Hydrological cycle. Water as a universal solvent. Concept of DO, BOD and COD. Sedimentation, coagulation, flocculation, filtration, pH		
Unit II	Natural Resources: Renewable and Non- renewable resources	5
Land as a resource, land degradation, landslides (natural and man-induced), soil erosion and desertification. Forests and forest resources: Use and over-exploitation, deforestation. Impacts of deforestation, mining, dam building on environment and forests. Resettlement and rehabilitation of project affected persons; problems and concerns with examples. Water resources: Use and over-exploitation of surface and ground water, floods, drought, conflicts over water (international and inter-state). Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems with examples. Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs. Aims and objectives of Environmental Impact Assessment (EIA)		
Unit III	Biodiversity and Conservation	5
Levels of biological diversity: genetic, species and ecosystem diversity.Bio-geographic zones of India. Ecosystem and biodiversity services. Biodiversity patterns and global biodiversity hot spots, India as a mega-biodiversity nation; Endangered and endemic species of India. Threats to biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.		
Unit IV	Environmental Pollution	4
Environmental pollution and its types.Causes, effects and control measures of :a) Air pollution b) Water pollution – freshwater and marine c) Soil pollution d) Noise pollution e) Thermal pollution Nuclear hazards and human health risks,Solid waste management: Control measures of urban and industrial waste. Indian National Ambient Air Quality Standards. Impact of air pollutants on human health, plants and materials		
Unit V	Environmental Policies and Practices	5
Concept of sustainability and sustainable development.Water conservation and watershed management.Climate change, global warming, acid rain, ozone layer depletion. Disaster management: floods, earthquake, cyclones and landslides. Wasteland reclamation. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental		

legislation. Environment: rights and duties. Population growth., Water conservation, rainwater harvesting, watershed management, Environmental Ethics – Issues and possible solution, Field work , Visit to a local polluted site-Urban/Rural/Industrial/Agricultural , Study of simple ecosystems-pond, river, hill slopes, etc.	
Text Books	1. Bharucha. E,Textbook of Environmental Studies for Undergraduate Courses
Reference Books	1. KaushikAnubha, Kaushik C P, Perspectives in Environmental Studies, New Age Publication 2. Rajagopalan , Environmental Studies from Crisis to Cure, Oxford University Press
Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	28-05-2022
Date of approval by the Academic Council	20/10/2022

Course Outcome for CY3205

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to correlate the human population growth and its trend to the environmental degradation and develop the awareness about his/her role towards environmental protection and preventions.	2	Em
CO2	Students should be able to understand the solutions related to environmental problems related with the renewable & non-renewable resources.	2	S
CO3	Students should be able to understand the importance of ecosystem and biodiversity and the method of conservation of biological diversity.	2	S
CO4	Students should be able to understand different components of the environment and their function and the effects pollution on environment and should be able to understand the concept of sustainable development.	2	En
CO5	Students should be able to correlate the human population growth and its trend to the environmental degradation and develop the awareness about his/her role towards environmental protection and preventions.	1	None

CO-PO Mapping for CY3205

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	1	1	2	1	2	3	1	3	1	2	1	3	2
CO 2	2	1	1	1	2	1	2	1	3	2	3	2	2	3
CO 3	2	2	3	3	1	3	3	1	2	1	3	2	3	2
CO 4	2	3	1	1	2	3	1	3	3	3	3	3	1	1
CO 5	1	1	3	1	3	1	2	3	3	3	3	2	2	2
Avg.	2	1.6	1.8	1.6	1.8	2	2.2	1.8	2.8	2	2.8	2	2.2	2

ME3103	Title: Fundamentals of Mechanical and Mechatronics Engineering	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To impart basic knowledge about various fields of Mechanical Engineering like Thermal Engineering, manufacturing, Mechanics, Strength of Materials and mechatronics.	
Expected Outcome	After learning the course the students will be able to understand basic laws of thermodynamics, basic manufacturing processes ,mechanics,working of IC engines and mechatronics	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Thermodynamics & IC Engines	6
Definition of thermodynamics, Energy and its forms, Enthalpy, Laws of thermodynamics, Heat engines, Heat pump, Refrigerator, Types of refrigerants, and Introduction to Air-conditioning. Internal Combustion Engines: Classification and components of I.C. Engines, Working principle and comparison between 2 Stroke and 4 stroke engines, Difference between SI and CI engines.		
Unit II	Mechanics	6
Basic concept: Review of laws of motion, Concept of Free Body Diagrams, Types of supports and their reactions - requirements of stable equilibrium - Moments and Couples -Varignon's theorem - Equilibrium of Rigid bodies in two dimensions, Basic concepts of Friction and Trusses.		
Unit III	Stress and Strain	8
Introduction, Normal &shear stresses, Stress-strain diagrams for ductile and brittle materials, Elastic constants, One dimensional loading of members of varying cross-section		
Unit IV	Introduction to Manufacturing	8
. Introduction and classification of the manufacturing processes, Lathe and basic machining operations in lathe, Cutting tools, Cutting tool materials, Metal Forming: Forging and Sheet Metal operations, Joining Processes**:** Electric arc welding, Gas welding, Soldering and Brazing. Introduction to CNC machines		
Unit V	Introduction to Mechatronics	8
Evolution, Scope, Advantages and disadvantages of Mechatronics, Industrial applications of Mechatronics, Introduction to autotronics, bionics, and avionics and their applications. Sensors and Transducers: Types of sensors, types of transducers and their characteristics. Actuator and its types.		
Text Books	1. NitaigourMahalik .Mechatronics : Principles, Concepts and Applications, McGraw Hill 2. Onkar Singh, S.S Bhavikatti, Introduction to Mechanical Engineering, New Age International 3. Hajra, Bose, Roy, Workshop Technology Vol 1 and 2, Media Promoters 4. D.S. Kumar, Mechanical Engineering, S.K. Kataria and Sons	
Reference Books	1. Irving H.Shames, Engineering Mechanics , P.H.I 2. Holman, J.P, Thermodynamics, McGraw Hill book Co. NY 3. Chapman W.A.J, Workshop Technology Part 1, Elsevier Science	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by the Academic Council	20/10/2022	

Course Outcome for ME3103

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to understand application of the laws of thermodynamics to wide range of systems and aware about the basics of thermal engineering applications in IC engines and its working.	2	Em
CO2	Students should be able to know and apply the types of forces and concepts used to analyze force mechanisms	2	S
CO3	Students should be able to analyze and understand the Stress-strain diagrams and use of material.	2	S
CO4	Students should be able to understand the various machining processes	2	En
CO5	Students should be able to gain knowledge on the various engineering materials and their properties.	1	None

CO-PO Mapping for ME3103

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	2	2	2	2	3	3	1	1	1	3	1	1	3
CO 2	2	1	2	2	2	2	1	2	1	1	1	2	1	1
CO 3	2	1	2	1	1	1	1	3	3	3	2	1	1	2
CO 4	2	3	1	1	2	2	2	2	2	3	3	1	2	1
CO 5	1	1	3	1	1	2	1	1	3	2	3	3	2	2
Avg.	2	1.6	2	1.4	1.6	2	1.6	1.8	2	2	2.4	1.6	1.4	1.8

CS3207	Title:Advance Computer Programming & Software	L T P C 4 0 0 4
Version No.	1.0	
Course Prerequisites	Nil	
Objective	This subject introduces the students with a deeper era of programming in C like Functions, Arrays, Pointer, Structure and Preprocessor Directive etc.	
Expected Outcome	On completion of subject the students will be able to apply learning Advance C, Device Driver Programming, Embedded C, Robotics Programming	
Unit No.	Unit Title	No. of Hrs (Per Unit)
Unit I	Pointers & Beyond Pointers	9
About Pointer [Declaration, Initialization and Access], Concept of memory maps, Concept of Process Control Block, Dangling Pointer, Orphan Objects, Dynamic Memory Allocation [malloc; calloc, realloc, free], Segmentation Fault, Core Dump and Illegal Memory Access, Pointer Arithmetic, Multiple Indirections.		
Unit II	Pointers & Arrays	9
Arrays, Understanding in depth 1-D, 2-D and 3-D array, Converting an array [1-D, 2-D, 3-D, n-D] to its pointer notation, Accessing array[1-D, 2-D, 3-D, n-D]with pointer, Creating Variable length array [1-D, 2-D], Limitation with array, Array of Pointers		
Unit III	Pointers & Functions, Arrays & Function	10
Understanding of function, Pointer pointing to function with different declarations, Accessing function with its pointer, Concept of Function returning function. Variable length arguments, Implementation of myPrintf and myScanf.Mixed Concepts:Array containing function(s), Array Containing array(s) [1-D, 2-D], Function returning array [1-D, 2-D].		
Unit IV	Making Header File and C Library	10
Understanding Preprocessor Directives and Compilation Process, Concept of Multiple Inclusion, Guard Macros, Role of Guard macros, Making Sample Header file, Understanding Concept of Linker, Creating Object code of function definition, Storing Object code in library, Setting path for Linker, Running code with user defined Header file and Library.		
Unit V	Tools and Software	10
Understanding Text Editors [vi and NANO], Understanding IDE (Integrated Development Environment) [Eclipse, Netbeans and .Net Framework], VB Code Editor in MS Excel, Introduction AutoCAD, Introduction Matlab, Introduction CATIA, Introduction FreePCB		
Text Books	1. "Mastering C" by KR Venugopal 2. "Let us C" by Y. kanetkar 3. "Programming in ANSI C" by E. Balagurusamy.	
Reference Books	1. Kernighan,B.W and Ritchie,D.M, "The C Programming language", Pearson Education, 2. 2. Byron S Gottfried, " Programming with C", Schaum's Outlines Tata McGraw-Hill 3. 3. R.G. Dromey, "How to Solve it by Computer", Pearson Education	
Mode of Evaluation	Internal and External Examinations	
Recommended by Board of Studied on	28-05-2022	
Date of Approval by the Academic Council on	20/10/2022	

Course Outcome forCS3207

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to Develop basic understanding of computers, the concept of algorithm, C programming and algorithmic/Programming thinking.	2	Em
CO2	Students should be able to use the C programming language to implement various algorithms, and develops the basic concepts and terminology of programming in general.	2	S
CO3	Students should be able to understand pointers, arrays, functions and macros that will be able to help them to design new problem solving approach in 'C'.	2	S
CO4	Students should be able to acquire the knowledge of different software's on different Operating System Platform such as Linux/Windows (Open Source and Licensed) with understanding of different IDE.	2	En
CO5	Students should be able to gain a broad perspective about the uses of computers in engineering industry.	1	None

CO-PO Mapping for CS3207

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	2	1	2	3	3	2	2	1	3	2	2	1	2
CO 2	1	2	3	2	1	2	1	3	3	1	3	2	1	1
CO 3	2	1	1	1	1	1	3	3	2	1	1	3	1	2
CO 4	2	3	2	2	1	2	1	3	1	3	3	2	1	1
CO 5	1	3	2	1	1	1	2	2	3	2	3	3	3	2
Avg.	1.8	2.2	1.8	1.6	1.4	1.8	1.8	2.6	2	2	2.4	2.4	1.4	1.6

PH3140	Title: Engineering Physics LAB	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	The Objective of this course is to make the students gain practical knowledge to co-relate with the theoretical studies. To achieve perfectness in experimental skills and the study of practical applications will bring more confidence and ability to develop and fabricate engineering and technical equipment's.	
Expected Outcome	On Completion of this course, students are able to – Develop skills to impart practical knowledge in real time solution. Understand principle, concept, working and application of new technology and comparison of results with theoretical calculations.	

List of Experiments

1. To determine the wavelength of monochromatic light by Newton's ring.
2. To determine the wavelength of monochromatic light with the help of Fresnel's biprism.
3. To determine the focal length of two lenses by nodal slide and locate the position of cardinal points.
4. To determine the specific rotation of cane sugar solution using half shade polarimeter.
5. To determine the wavelength of spectral lines using plane transmission grating.
6. To determine the specific resistance of the material of given wire using Carey Foster's bridge.
7. To determine the variation of magnetic field along the axis of a current carrying coil and then to estimate the radius of the coil.
8. To verify Stefan's Law by electrical method.
9. To calibrate the given ammeter and voltmeter.
10. To study the Hall effects and determine Hall coefficient, carnier density and mobility of a given semiconductor material using Hall-effect set up.
11. To determine energy bank gap of a given semiconductor material.
12. To determine E.C.E. of copper using Tangent or Helmholtz galvanometer.
13. To draw hysteresis curve of a given sample of ferromagnetic material and from this to determine magnetic susceptibility and permeability of the given specimen.
14. To determine the ballistic constant of a ballistic galvanometer.
15. To determine the viscosity of a liquid.

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	28-05-2022
Date of approval by the Academic Council	20/10/2022

Course Outcome for PH3140

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to understand the process of performing the experiments on wavelength and focal length practically.	2	Em
CO2	Students should be able to verify the theoretical calculations with observed results in practical experiments.	2	S
CO3	Students should be able to Enhance the skills of using apparatus for verification of different laws.	2	S

CO-PO Mapping for PH3140

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	1	1	1	2	2	1	2	1	1	2	3	1	2	3
CO 2	2	3	1	2	3	1	3	2	1	3	1	2	1	2
CO 3	3	3	1	3	1	3	1	2	3	1	1	3	3	3
Avg.	2	2.3	1	2.3	2	1.7	2	1.7	1.7	2	1.7	2	2	2.7

CS3245	Title: Advance Computer Programming & Software Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	Study of basic web principles introduced in Programming Fundamentals. Advanced concepts of program design, implementation and testing. Study of domain specific Software's	
Expected Outcome	Know concepts in problem solving, to do programming in C language. To write diversified solutions using C language. Study of domain specific Software	

List of Experiments

1. WAP accessing function definition with the help of pointer.
2. WAP accessing 2-D Array with the help of pointer.
3. WAP declaring an array taking length from the user.
4. WAP declaring 2-D array by using Dynamic memory allocation technique.
5. WAP passing arguments to main function.
6. WAP making function accepting VAR_ARGS.
7. Case Study on VB Script in Excel File.
8. Case Study on Matlab Tool.
9. Case Study on FreePCB Tool.
10. Case Study on AutoCAD.

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	28-05-2022
Date of approval by the Academic Council	20/10/2022

Course Outcome forCS3245

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to develop Pointer, recursion, functions and array based programs in C.	2	Em
CO2	Students should be able to develop Dynamic memory allocation technique based programs and execute Command line Arguments in C.	2	S
CO3	Students should be able to execute C programs and Shell Commands in Unix Environment.	2	S

CO-PO Mapping for CS3245

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	1	3	3	1	1	1	3	2	3	3	2	3	1	2
CO 2	1	2	2	3	3	1	2	2	1	1	2	1	3	2
CO 3	3	1	2	1	1	1	2	2	2	1	1	1	2	1
Avg.	1.7	2	2.3	1.7	1.7	1	2.3	2	2	1.7	1.7	1.7	2	1.7

ME3140	Title: Workshop Practice	L T P C 0 0 3 2
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To know about the working methods adopted in various mechanical shops along with tools and equipment's for making a product. To understand the working of IC engines, Refrigerator, Air conditioner	
Expected Outcome	Student will be able to develop skill in using machines,tools and knowing the basic operations in each shop along with understanding the working of IC engine,refrigerator and airconditioner.	

List of Experiments

1. Carpentry Shop:
   - I. Study of tools and operations and carpentry joints.
   - II. To prepare half-lap corner joint / mortise - tendon joint.
   - III. To make duster from wooden piece using carpentry tools

2. Fitting (Bench Working) Shop:
   - I. Study of tools and operations.
   - II. Step fitting of two metal plates using fitting tools.
   - III. Drilling and Tapping for generating hole and internal thread on a metal plate.

3. Black Smithy Shop:
   - I. Introduction of different Forging process.
   - II. Study of tools and operations such as upsetting, drawing down, punching, bending, fullering and swaging.
   - III. To forge chisel from MS rod.

4. Welding Shop:
   - I. Introduction of Welding and its classification.
   - II. Simple butt and Lap welded joints.

5. Sheet-metal Shop:
   - I. Introduction of various sheet metal operations.
   - II. Study of tools and operations.
   - III. To make geometrical shape like frustum, cone and prisms using GI sheet.

6. Machine Shop:
   - I. Introduction of Single point cutting tool, various machine tools.
   - II. Simple operations like Plane turning, Step turning and Taper turning.

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	28-05-2022
Date of approval by the Academic Council	20/10/2022

Course Outcome for ME3140

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students will be able to develop the ability to perform the various operations with the help of lathe machine and its tools	2	Em
CO2	Students will be able to develop the ability to perform the various operations using welding	2	S
CO3	Students will be able to develop the ability to perform the various operations using fitting tools	2	S
CO4	Students will be able to develop the ability to perform the various operations on wood using carpentry tools	2	En
CO5	Students will be able to develop the ability to perform the various operations using blacksmith tools	1	None

CO-PO Mapping for ME3140

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	1	3	1	1	1	2	3	2	1	3	2	2	2	1
CO 2	3	3	3	1	1	1	3	3	2	1	3	1	1	3
CO 3	1	1	3	1	2	3	1	3	3	2	2	2	2	1
CO 4	1	2	1	3	1	1	1	1	2	3	3	2	1	2
CO 5	1	3	2	3	3	2	1	1	2	2	2	1	1	2
Avg.	1.4	2.4	2	1.8	1.6	1.8	1.8	2	2	2.2	2.4	1.6	1.4	1.8

CE3102	Title: Disaster Preparedness & Management	L T P C 2 0 0 2
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	The course is intended to provide a general concept in the dimensions of disasters caused by nature beyond the human control as well as the disasters and environmental hazards induced by human activities with emphasis on disaster preparedness, response and recovery.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit: 1	Introduction to Disasters:	5
Concepts, and definitions (Disaster, Hazard, Vulnerability, Resilience, Risks)		
Unit II	Disasters: Classification, Causes, Impacts	4
(Including social, economic, political, environmental, health, psychosocial, etc.) Differential impacts- in terms of caste, class, gender, age, location, disability Global trends in disasteis!urban disasters, pandemics, complex emergencies, Climate change		
Unit III	Approaches to Disaster Risk reduction	5
Disaster cycle - its analysis, Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural ensures, roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), states, Centre, and other stake-holders..		
Unit IV	Inter-relationship between Disasters and Development:	5
Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc. Climate Change Adaptation. Relevance of indigenous knowledge, appropriate technology and local resources		
Unit V	Disaster Risk Management in India	5
Hazard and Vulnerability profile of India Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management Institutional arrangements (Mitigation, Response and Preparedness, DM Act and Policy, Other related policies, plans, programmes and legislation)		
Text Books	1. Bhattacharya, Disaster Science and Management, McGraw Hill Education Pvt. Ltd.	
Reference Books	1. Dr. Mrinalini Pandey, Disaster Management, Wiley India Pvt. Ltd. 2. Jagbir Singh, Disaster Management: Future Challenges and Opportunities, K W Publishers Pvt. Ltd.	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by the Academic Council	20/10/2022	

Course Outcome for CE3102

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students will be able to understand the basic concepts of disasters and its relationships with development.	2	Em
CO2	Students will be able to understand the approaches of Disaster Risk Reduction (DRR) and the relationship between vulnerability, disasters, disaster prevention and risk reduction.	2	S
CO3	Students will be able to understand the Medical and Psycho-Social Response to Disasters.	2	S
CO4	Students will be able to prevent and control Public Health consequences of Disasters	2	En
CO5	Students will have awareness of Disaster Risk Management institutional processes in India	1	None

CO-PO Mapping for CE3102

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	1	3	2	1	2	1	3	2	2	3	3	2	1	2
CO 2	2	2	1	3	1	3	3	2	1	1	1	3	3	3
CO 3	1	3	1	2	3	3	2	3	2	1	3	3	1	3
CO 4	2	2	3	2	2	1	2	2	2	2	3	2	3	3
CO 5	3	2	2	3	2	3	2	3	3	1	1	1	1	3
Avg.	1.8	2.4	1.8	2.2	2	2.2	2.4	2.4	2	1.6	2.2	2.2	1.8	2.8

HU3201	**Title: Indian Knowledge System**	**L T P C** **1 0 0 1**
Version No.	**1.0**	
Course Prerequisites	Nil	
Objectives		
Unit Nos.	**Unit Title**	**Number of hours (Per Unit)**
Unit 1	**Overview of IKS**	2
Survey of IKS Domains: A broad overview of disciplines included in the IKS, and historical developments. Sources of IKS knowledge, classification of IKS texts, a survey of available primary texts, translated primary texts, and secondary resource materials. Differences between a sutra, bhashya, karika, and vartika texts. Fourteen/eighteen vidyasthanas, tantrayukti		
Unit 2	**Vocabulary of IKS**	2
Introduction to Panchamahabhutas, concept of a sutra, introduction to the concepts of non-translatable (Ex. dharma, punya, aatma, karma, yagna, shakti, varna, jaati, moksha,loka, daana, itihaasa, puraana etc.) and importance of using the proper terminology. Terms such as praja, janata, loktantra, prajatantra, ganatantra, swarjya, surajya, rashtra, desh,		
Unit 3	**Philosophical foundations and Methods of IKS**	3
Philosophical foundations of IKS: Introduction to Samkhya, vaisheshika and Nyaya Methods in IKS: Introduction to the concept of building and testing hypothesis using the methods of tantrayukti. Introduction to pramanas and their validity, upapatti; Standards of argumentation in the vada traditions (introduction to concepts of vaada, samvaada, vivaada, jalpa, vitanda). Concept of poorvapaksha, uttarapaksha		
Unit 4	**Case Studies**	2
• Mathematics of Madhava, Nilakantha Somayaji • Astronomical models of Aryabhata • Wootz steel, Aranumula Mirrors, and lost wax process for bronze castings • Foundational aspects of Ayurveda • Foundational aspects of Ashtanga yoga • Foundational aspects of Sangeeta and Natya shastra		
Unit 5	**India and the World**	3
Influence of IKS on the world, knowledge exchanges with other classical civilizations, and inter-civilizational exchanges.		
Text Books		
Reference Books	• An Introduction to Indian Knowledge Systems: Concepts and Applications, B Mahadevan, V R Bhat, and Nagendra Pavana R N; 2022 (Prentice Hall of India). • Indian Knowledge Systems: Vol I and II, Kapil Kapoor and A K Singh; 2005 (D.K. Print World Ltd). • The Beautiful Tree: Indigenous India Education in the Eighteenth Century, Dharampal, Biblia Impex, New Delhi, 1983. Reprinted by Keerthi Publishing House Pvt Ltd., Coimbatore, 1995. • Indian Science and Technology in the Eighteenth Century, Dharampal. Delhi: Impex India, 1971. The British Journal for the History of Science. • The Wonder That Was India, Arthur Llewellyn Basham, 1954, Sidgwick& Jackson. • The India they saw series (foreigner visitors on India in history from 5CE to 17th century), Ed. Meenakshi Jain and Sandhya Jain, Prabhat Prakashan	
Mode of Evaluation	Internal and External Examination	
Recommended by the Board of	28-05-2022	

Studies on	
Date of approval by the Academic Council on	20/10/2022

Course Outcome for HU3201

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp.)/ Skill(S)/ Entrepreneurship (Ent.)/ None (*Use , for more than One*)
CO1	The students will be able to understand the Indian Knowledge System such as historical development, sources and scope.	2	S
CO2	The students will be able to understand the vocabulary system of Indian knowledge system.	2	S
CO3	The students will be able to understand and apply the philosophical foundations and methods of IKS.	3	N
CO4	The students will be able to execute the case studies based on the Indian knowledge system.	3	N
CO5	The students will be able to understand the influence of Indian Knowledge System on world.	2	S

CO-PO Mapping for HU3201

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	0	0	2	3	0	0	3	2	1	1	2	1	0	0
CO 2	2	3	1	0	1	0	1	1	2	0	3	1	2	3
CO 3	2	0	1	2	1	1	1	1	1	2	2	1	2	0
CO 4	2	1	1	0	0	2	1	3	2	2	0	2	2	1
CO 5	1	1	2	1	3	2	3	0	1	0	3	3	1	1
Avg.	1.4	1	1.4	1.2	1	1	1.8	1.4	1.4	1	2	1.6	1.4	1

VP3201	Title:Communication and Soft Skills-II	L T P C 1 0 2 2
Version No.	1.0	
Course Prerequisites	VP3101	
Objectives	• To develop the English communication skills of our students. • To enable them to communicate effectively and nurture their speaking skills in English. • To inculcate in our students the ability to develop soft skills and professional etiquettes which will make them more suitable for jobs in the corporate sector. • To overcome interaction phobia as English is not their mother tongue.	
Expected Outcome	• After the Course the students will be able to write/understand and create sentences in English of all tenses. • They will be able to take part in daily routine conversations in English. • Students will be able to understand and be partially groomed in corporate etiquettes and culture	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Functional Grammar	6
• How to use- noun, pronoun, verb, adjective, adverb, preposition, conjunction • How to use Tenses-past, present, future • Modal verbs- can/could, shall/should, will/would, may/might, must, ought to • Articles- a, an, the, no article		
Unit II	Speaking Skills	10
Introduction • Describe yourself, your educational background, family, hobbies, strengths • Let's talk- making conversation, meeting and greeting people • Opinions, likes and dislikes **World Around Me** • Life at college, hostel etc. • Market place, bus stop, bank, post office • Village, town and city • Eating out ata Restaurant		
Unit III	Personality Enhancement	5
• First impression: Dressing sense, good manners, speaking well and respectably • Positive Attitude: Being happy and alert, a good listener and a good friend • Goal setting, confidence building and handling rejection		
Unit IV	Vocabulary Development	5
• Word Formation: Prefix, suffix, conversion and compound words • Homophones and one-word substitution • Words often confused and misused • Idiomatic phrases • Antonyms and synonyms		
Unit V	Listening	4
• Main point in short simple conversations and messages		

• Essential information in short recorded passages on diverse matters		
Unit VI	**Reading and Writing**	6
• Reading and writing of short, simple notes and messages • Basic descriptions about everyday life in simple sentences • Short simple descriptions of events and reporting what happened when and where • Simple e-mail or letter including expressions for greeting, addressing, asking or thanking • Completing a questionnaire giving information about background, interests, skills		
Text Books	3. High School Grammar by Wren & Martin revised by Dr. N.D.V.Prasada Rao (S.Chand) 4. Personality development by Harold R. Wallace (Cengage Learning)	
Reference Books	5. Essential English grammar by Raymond Murphy (Cambridge Univ. Press) 6. Practical English Usage by Michael Swan (Oxford) 7. Personality Development & Soft skills by Barun K. Mitra; 2nd edition (Oxford Univ. Press) 8. **Online Resources:**Flipboard, TEDx, Youtube	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by the Academic Council	20/10/2022	

Course Outcome for VP3201

Course code	**VP3201**
Paper Title	**Communication and Soft Skills-II**
CO1	After the course the students will be able to write/understand and create sentences in English of all tenses, Students will heighten their awareness of correct usage of English grammar in writing and speaking and will be able to improve their speaking ability in English both in terms of fluency and comprehensibility.
CO2	Students will be able to take part in daily routine conversation in English.
CO3	Students will be able to understand and partially be groomed in corporate etiquettes and culture
CO4	This course will aid the students to learn new vocabulary words, use them correctly in a sentence while speaking and writing, , and understand their meaning in the text

CO5	The students will learn to use strategies to listen actively, will be able to distinguish more important ideas from less important ones and will participate in the discussions.

SEMESTER 3

CE3308	Title: **Applied Hydraulics**	**L T P C** **3 0 0 3**
Version No.	**1.0**	
Course Prerequisites	**Nil**	
Objectives	To give knowledge on properties and behavior of fluid under various conditions	
Unit No.	**Unit Title**	**No. of hours (per Unit)**
Unit: I	**Introduction**	6
Fluid properties, Types of fluids, continuum principle, Basic equations, Introduction to pumps and turbines		
Unit II	**Fluid Kinematics**	6
Visualization of flow, Types of flow, Streamline, Path line, Streak line, Principle of conservation of mass, Velocity, acceleration, Velocity potential and Stream function, Vortices, Circulation.		
Unit III	**Fluid Static & Dynamics**	8
Basic equations, manometers, hydrostatic forces on submerged surfaces, buoyancy. Euler's equation, Bernoulli's equation and its applications, momentum and angular momentum equations and their applications.		
Unit IV	**Boundary Layer Theory**	8
Introduction to boundary layer theory Uniform flow computations in open channels, Critical flow computations in Open Channel, Gradually Varied Flow, (Applications in canals and rivers)		
Unit V	**Drag and Lift**	6
Skin-friction and form drag -cylinder and flat plate, Von Karman vortex shedding, generation of lift around a cylinder, lifting vanes.		
Text Books	1. Som, S.K. and Biswas, G., "Fluid Mechanics and Fluid Mechanics", Tata McGraw Hill 2. Garde, R.J. and Mirajgaoker, A.G., "Engineering Fluid Mechanics", Nem Chand & Bros.	
Reference Books	1. Fox, R.W. and McDonald, A.T., "Introduction to Fluid Mechanics", John Wiley & Sons 2. Asawa, G.L., "Fluid Flow in Pipes and Channels", CBS Publishers 3. Schlichting, H. and Gersten, K., "Boundary Layer Theory", Springer.	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by the Academic Council	20/10/2022	

Note: Students will undergo a visit on hydraulic structures like canals & bridges

Course Outcome for CE3308

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to understand the concept of fluids & their types, related equations & theorems, concepts of pumps & turbines.	4	S
CO2	Students should be able to understand the concept of steam line, streamline, path flow, vortices& acceleration related with fluid flows.	3	S
CO3	Students should be able to understand the concept of fluids manometer, hydrostatic forces on submerged bodies, various important equations & theorems.	4	En
CO4	Students should be able to understand the concept of fluids boundary layer theories, behavior of fluid flows in open channels.	4	En
CO5	Students should be able to understand the concept of fluids drag, skin frictions on various elements, lift & drag theories.	3	En

CO-PO Mapping for CE3308

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	1	2	2	1	2	2	3	3	3	3	3	2	2
CO 2	1	3	3	3	2	1	3	2	1	2	3	1	2	2
CO 3	1	2	2	3	2	3	1	1	2	3	3	1	3	3
CO 4	3	3	1	1	3	3	3	3	3	3	3	1	3	2
CO 5	1	2	3	1	3	3	3	1	3	1	2	1	3	2
Avg.	1.8	2.2	2.2	2	2.2	2.4	2.4	2	2.4	2.4	2.8	1.4	2.6	2.2

CE3310	Title:Basics of Geology & Rock Mechanics	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To impart knowledge to students about types of rock and their formation as well as structures.	
Unit No.	Unit Title	No. of hours (Per Unit)
Unit I	Introduction	8
Dimensions of earth and its structure, Composition and Origin of earth-envelops of the Earth- crust, Mantle, Core. Internal dynamic process- Plate tectonics- Continental drift, Earthquake and volcanoes. External dynamic process- Weathering, Erosion and Deposition, Geological time scale.		
Unit II	Minerals and Rocks	8
Minerals and Rocks: Properties and identification of specimens in hand and under microscope.Origin of igneous (Intrusive and Extrusive rock), Sedimentary and metamorphic rocks. Sedimentary structures-petrographic character of conglomerate, Sandstone, Shale, Limestone.		
Unit III	Stratigraphy	8
Stratigraphy: Stratigraphy principle, Sequence, Litho-stratigraphy, Bio-stratigraphy, Stratigraphy of India –basics.		
Unit IV	Structural Geology	6
Structural Geology, Rock structure type, Fault, Topography, Outcrops, Deformation of rocks, Simple dipping beds, Folds, Faults, Joints, Unconformity, Classification, , Igneous intrusion-dykes, Sill and batholiths, Formation of Himalayas,		
Unit V	Geological Investigations	6
Geological investigation for site selections of Dams, Reservoir, Tunnels, Bridges, Residential & Commercial Buildings, Industrial structures, and All weather roads.		
Text Books	1. Holmes, A., ‘‘Principles of Physical Geology’’, Ronald Press. 2. Mukherjee, P.K., ‘‘A Text Book of Geology’’ The World.	
Reference Books	1. Ramakrishnan, M., Vaidyanathan, R., ‘‘Geology of India’’,Geological Society of India Publication. 2. Raymond, L.A., ‘‘Petrology: The study of Igneous, Sedimentaryand Metamorphic Rocks’’, McGraw Hill.	
Mode of Evaluation	Internal and External Examination	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by the Academic Council	20/10/2022	

Course Outcome for CE3310

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students will be able to understand basics of geology	2	S
CO2	Students will be able to understand minerals and rocks	2	S
CO3	Students will be able to understand Stratigraphy	2	S
CO4	Students should be able to understand Structural Geology	2	S
CO5	Students will be able to understand Geological Investigations of various structures	2	S

CO-PO Mapping for CE3310

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	2	1	1	3	1	3	1	2	1	1	3	2	1
CO 2	2	3	1	3	1	2	2	1	3	1	2	2	3	3
CO 3	2	1	3	3	2	2	2	2	3	1	1	3	3	2
CO 4	2	1	2	3	1	2	2	3	1	3	3	2	1	1
CO 5	2	2	3	1	1	1	3	3	2	1	1	1	3	2
Avg.	2.2	1.8	2	2.2	1.6	1.6	2.4	2	2.2	1.4	1.6	2.2	2.4	1.8

CE3312	Title:Material Testing & Evaluation	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To Make measurements of behavior of various materials used in Civil Engineering.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit: I	Introduction to engineering materials	8
Cements, Sand, Concrete (plain, reinforced and steel fiber / glass fiber reinforced, light weight concrete, high Performance Concrete, Polymer Concrete) Ceramics, and Refractories, Bitumen and asphaltic materials, Timbers, Glass and Plastics, Structural Steel and other Metals, Paints and Varnishes, Acoustical Material and geo-textiles, rubber and asbestos, laminates and adhesives, Graphene, Carbon composites and other engineering materials including properties and uses		
Unit II	Introduction to material testing	7
Introduction to material Engineering; Mechanical behavior and mechanical characteristics; Elasticity principle and characteristics; plastic deformation of metals; tensile test-standards for different material(brittle, quasi-brittle, elastic) True stress-strain interpretation of tensile test; hardness tests; bending and torsion test; strength of ceramic; Internal friction, creep fundaments and characteristics; Brittle fracture of steel-temperature transition approach; Background of fracture mechanics; fracture toughness testing for different materials; concept of fatigue of materials; Structural integrity assessment procedure and fracture mechanics		
Unit III	Standard testing & evaluation procedures	7
Mechanical testing of various metals; naming systems for various irons, steels and nonferrous metals;elastic deformation; plastic deformation. Impact test and transition temperatures; fracture mechanics background; fracture toughness-differentmaterials; Fatigue of material; Creep.		
Unit IV	Standard testing procedures	7
Tests & testing of bricks, Tests & testing of sand, Tests & testing of concrete, Tests & testing of soils, Tests& testing of bitumen & bituminous mixes.		
Unit V	Testing procedures of special materials	7
Testing of polymers and polymer based materials, tests and testing of metals, special materials, composites andcementations materials. Explanation of mechanical behavior of these materials		
Text Books	1. Chudley, R., Greeno, "building construction handbook", R. Butterorth Heinemann, 6th edition, 2006. 2. Khanna, S.K., Justo, C.E.G and Veeraragavan, A, "Highway Materials and Pavement Testing", NemChand & Bros, 5th Edition.	
Reference Books	1. Various related updated & recent standards of BIS, IRC, ASTM, RILEM, AASHTO, etc. Corresponding to materials used for Civil Engineering applications.	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by the Academic	20/10/2022	

Council	

Course Outcome for CE3312

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to understand properties and usage of engineering materials	2	S
CO2	Students should be able to learn property and usage of materials	2	S
CO3	Students should be able to understand properties and usage of standard testing and evaluation procedures	2	En
CO4	Students should be able to understand the usage of standard testing procedure.	2	En
CO5	Students should be able to perform the test of special materials	2	En

CO-PO Mapping for CE3312

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	3	2	2	1	3	2	2	3	2	2	2	2	2
CO 2	1	1	1	2	2	3	3	1	3	1	2	3	2	1
CO 3	1	1	3	2	2	3	1	2	1	1	2	3	3	3
CO 4	1	3	3	2	3	2	1	3	3	3	2	2	3	2
CO 5	1	3	2	1	3	1	2	2	1	1	2	3	3	1
Avg.	1.2	2.2	2.2	1.8	2.2	2.4	1.8	2	2.2	1.6	2	2.6	2.6	1.8

CE3313	Title:Construction Engineering & Management	L T P C 20 0 2
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To study the various management techniques for successful completion of construction projects.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	The owners' perspective	4
Introduction - Project Life Cycle - Types of Construction - Selection of Professional Services - Construction Contractors - Financing of Constructed Facilities - Legal and Regulatory Requirements - Changing Environment of the Construction Industry - Role of Project Managers.		
Unit II	Organizing for project management	6
Project Management – modern trends - Strategic Planning - Effects of Project Risks on Organization - Organization of Project Participants -Traditional Designer-Constructor Sequence -Professional Construction Management - Owner-Builder Operation - Turnkey Operation -Leadership and Motivation for the Project Team.		
Unit III	Design and construction process	6
Design and Construction as an Integrated System - Innovation and Technological Feasibility - Innovation and Economic Feasibility - Design Methodology - Functional Design - Construction Site Environment.		
Unit IV	Labour, material and equipment utilization	4
Historical Perspective - Labour Productivity - Factors Affecting Job-Site Productivity – Labour Relations in Construction - Problems in Collective Bargaining - Materials Management – Material Procurement and Delivery - Inventory Control - Tradeoffs of Costs in Materials Management. - Construction Equipment - Choice of Equipment and Standard Production Rates – Construction Processes Queues and Resource Bottlenecks.		
Unit V	Cost estimation	4
Costs Associated with Constructed Facilities - Approaches to Cost Estimation - Type of Construction Cost Estimates - Effects of Scale on Construction Cost - Unit Cost Method of Estimation - Methods for Allocation of Joint Costs - Historical Cost Data - Cost Indices - Applications of Cost Indices to Estimating - Estimate Based on Engineer's List of Quantities - Estimation of Operating Costs.		
Text Books	1.Basic of civil engineering, Eagle Publication	
Reference Books	1.S.K. Duggal: Building Materials, New Age International Publishers 2. GopalRanjan& Rao, A.S.R., "Basics of Applied Soil Mechanics", New Age International Publishers. 3.M. S. Shetty " Concrete Technology": S Chand Publication 4.A.K. Jain, " Reinfored Concrete", Nem Chand & Bros S.K. Duggal, "Steel Structures", TMH	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by the Academic	20/10/2022	

Council	

Course Outcome for CE3313

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to understand The owners' perspective	2	S
CO2	Students should be able to understand the concept of Organizing for project management	2	S
CO3	Students should be able to understand the Design and construction process	2	S
CO4	Students should be able to understand about the Labour, material and equipment utilization	2	S
CO5	Students should be able to understand the concept of Cost estimation	2	S

CO-PO Mapping for CE3313

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	3	2	2	1	3	2	2	3	2	2	2	2	2
CO 2	1	1	1	2	2	3	3	1	3	1	2	3	2	1
CO 3	1	1	3	2	2	3	1	2	1	1	2	3	3	3
CO 4	1	3	3	2	3	2	1	3	3	3	2	2	3	2
CO 5	1	3	2	1	3	1	2	2	1	1	2	3	3	1
Avg.	1.2	2.2	2.2	1.8	2.2	2.4	1.8	2	2.2	1.6	2	2.6	2.6	1.8

ME3308	**Title: Strength of Materials**	**L T P C** **3 2 0 4**
Version No.	**1.0**	
Course Prerequisites	Nil	
Objectives	To know conceptual applications of principles of mechanics on rigid and deformable bodies	
Unit No.	**Unit Title**	**No. of hours (per Unit)**
Unit I	**Stress and Strain**	6
Simple Stresses and Strains – Tension, Compression and Shear Stresses - Hooke's Law - Compound Stresses - Thermal Stresses – Compound Bars. Two-Dimensional System, Stress at a Point on a Plane, Principal Stresses and Principal Planes, Mohr's Circle.		
Unit II	**Shear Force and Bending Moment**	5
Shear Force and Bending Moment Diagrams for Beams and Simple Frames - Theory of Simple Bending, Bending Stress Distribution at Sections.		
Unit III	**Torsion**	6
Theory of Simple Torsion – Torsional Rigidity – Composite Shafts in Series and Parallel. Thin Cylinders and Shells – Thick Cylinders, Helical and Leaf Springs.		
Unit IV	**Deflection of Beams**	5
Derivation of Differential Equation of Moment Curvature Relation, Deflection of Simple Beams by Double Integration Method		
Unit V	**Columns and Struts**	4
Buckling of Column, Slenderness Ratio, Euler's Buckling Load for Slender Column, and Effective Length for Different End Condition. Introduction to Strain Energy, Stresses due to Impact and Concept of Virtual Work.		
Text Books	1 R K Bansal,Strength of Material, Kindle Edition. 2 R.K.Rajput,Strength of Materials, S.Chand.	
Reference Books	1. G.H.Ryder, Strength of Materials, Macmillan 2. P.K. Nag,Fundamentals of Strength of Materials, Wiley India 3. E. P. Popov, Engineering Mechanics of Solids, Prentice Hall. 4. P.Boresi , Advanced Mechanics of Materials, Wiley	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by the Academic Council	20/10/2022	

Course Outcome for ME3308

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to understand the resisting behavior of materials under loads in different loading condition like tension, compression etc. and applying the learnings though numerical problems	4	S
CO2	Students should be able to understand the behavior of beams under the action of shear force and bending moment and applying the learnings though numerical problems	4	S
CO3	Students should be able to understand the behavior of different machine elements such as shafts and springs under twisting load and applying the learnings though numerical problems	4	En
CO4	Students should be able to understand the behavior of beams under deflection and applying the learnings though numerical problems	4	En
CO5	Students should be able to understand the behavior of building elements such as columns and struts under different loading condition and applying the learnings though numerical problems	4	En

CO-PO Mapping for ME3308

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	1	2	3	1	3	2	2	1	3	2	1	3	2	1
CO 2	3	2	2	3	3	2	2	1	3	3	2	2	2	1
CO 3	3	2	2	3	1	3	2	2	2	2	3	2	3	2
CO 4	3	2	3	2	2	1	2	1	2	1	2	3	1	1
CO 5	2	1	2	1	3	2	1	2	1	1	3	3	1	3
Avg.	2.4	1.8	2.4	2	2.4	2	1.8	1.4	2.2	1.8	2.2	2.6	1.8	1.6

CE3345	Title: **Material Testing & Evaluation Lab**	**L T P C** **0 0 2 1**
Version No.	**1.0**	
Course Prerequisites	**Nil**	
Objectives	To impart basic knowledge of problems involving materials such as in aerodynamics, force of fluid on structural surfaces, transportation etc.	

List of Experiments

1. Test on brick
a) Shape and size test of brick
b) Determination of water absorption of brick.
c) Determination of compressive strength of brick
2. Test on Cement.
a) Determination of fineness of cement by dry sieving/ by air permeability method.
b) Determination of normal consistency of cement
c) Determination of initial and final setting time of cement
d) Determination of soundness of cement
3. Test on coarse aggregate and fine aggregate
a) Determination of fineness modulus and grain size distribution of fine/ Coarse aggregate
b) Determination of crushing value of coarse
4. Test on steel
1. Tensile strength of Steel

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	28-05-2022
Date of approval by the Academic Council	20/10/2022

Course Outcome for CE3345

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to perform test on brick	3	S
CO2	Students should be able to find the properties of cement	3	S
CO3	Students should be able to perform test on aggregate	3	En
CO4	Students should be able to perform test on steel	3	En
CO5	Students should be able to understand the properties of steel	2	En

CO-PO Mapping for CE3345

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	2	1	1	1	3	2	3	1	3	2	3	2	1
CO 2	2	1	1	3	2	3	1	3	3	2	2	2	3	2
CO 3	1	3	2	1	3	3	1	3	2	1	3	1	1	2
CO 4	3	2	1	1	1	2	1	3	2	1	3	1	3	1
CO 5	2	2	1	3	3	1	2	2	2	2	1	3	1	3
Avg.	2	2	1.2	1.8	2	2.4	1.4	2.8	2	1.8	2.2	2	2	1.8

CE3347	Title: **Fluid Mechanics & Hydraulics Lab**	L T P C 0 0 2 1
Version No.	**1.0**	
Course Prerequisites	**Nil**	
Objectives	To impart basic knowledge of problems involving flow of fluids such as in aerodynamics, force of fluid on structural surfaces, fluid transport.	

List of Experiments

1. To verify the Bernoulli's theorem.
2. To determine the friction factors for the pipes. (Major Losses)
3. To determine the Meta-centric height of a floating body.
4. To calibrate an orifice meter and study the variation of the co-efficient of discharge with Reynolds's number.
5. To determine the losses co-efficient for pipe fitting.
6. To study the transition from Laminar to Turbulent flow and to determine the Lower critical Reynolds's number.
7. To determine the coefficient of discharge of Venturimeter.
8. To determine the Manning's coefficient of roughness 'n' for the given channel bed
9. To study the characteristic of free hydraulic jump
10. To study the flow through a horizontal contraction in a rectangular channel

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	28-05-2022
Date of approval by the Academic Council	20/10/2022

Course Outcome for CE3347

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to understand the concept of Bernoulli's theorem & various losses in pipes.	3	S
CO2	Students should be able to understand the concept of Metacentric height of floating bodies & concepts of laminar & turbulent flows.	3	S
CO3	Students should be able to understand various coefficients of fluid flow.	3	En
CO4	Students should be able to understand the concept of Hydraulic jumps	3	En
CO5	Students should be able to conduct various test on fluids.	3	En

CO-PO Mapping for CE3347

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	2	1	1	3	1	3	1	2	1	1	3	2	1
CO 2	2	3	1	3	1	2	2	1	3	1	2	2	3	3
CO 3	2	1	3	3	2	2	2	2	3	1	1	3	3	2
CO 4	2	1	2	3	1	2	2	3	1	3	3	2	1	1
CO 5	2	2	3	1	1	1	3	3	2	1	1	1	3	2
Avg.	2.2	1.8	2	2.2	1.6	1.6	2.4	2	2.2	1.4	1.6	2.2	2.4	1.8

CE3349	Title: **Geology Lab**	L T P C 0 0 2 1
Version No.	**1.0**	
Course Prerequisites	**Nil**	
Objectives	To impart basic knowledge ofdifferent rocks and geological maps.	

List of Experiments

1. Study of physical properties and Identification of minerals.
2. Megascopic description and identification of igneous rocks.
3. Megascopic description and identification of Sedimentary rocks.
4. Megascopic description and identification of metamorphic rocks.
5. Dip and Strike Problems: To measure dip, dip direction and strike of given formations.
6. Geological cross section and study of geological map no-1
7. Geological cross section and study of geological map no-2
8. Geological cross section and study of geological map no-3
9. Geological cross section and study of geological map no-4
10. Geological cross section and study of geological map no-5

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	28-05-2022
Date of approval by the Academic Council	20/10/2022

Course Outcome for CE3349

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to understand about the properties of Igneous rock.	2	S
CO2	Students should be able to understand about the properties of Sedimentary rock.	2	S
CO3	Students should be able to understand about the properties of metamorphic rock.	2	S
CO4	Students should be able to analyze dip, dip direction and strike of given formations	3	S
CO5	Students should be able to understand the concept of Geological cross section and study of geological map.	2	S

CO-PO Mapping for CE3349

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	2	1	1	3	1	3	1	2	1	1	3	2	1
CO 2	2	3	1	3	1	2	2	1	3	1	2	2	3	3
CO 3	2	1	3	3	2	2	2	2	3	1	1	3	3	2
CO 4	2	1	2	3	1	2	2	3	1	3	3	2	1	1
CO 5	2	2	3	1	1	1	3	3	2	1	1	1	3	2
Avg.	2.2	1.8	2	2.2	1.6	1.6	2.4	2	2.2	1.4	1.6	2.2	2.4	1.8

ME3344	Title: Strength of Materials Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To know the methods to determine various properties of material.	

List of Experiments

1. Verification of principle of moment: Bell crank lever.
2. Determination of hardness of metals: Brinell / Vicker / Rockwell hardness test
3. Determination of impact strength of metals: Izod / Charpy impact test
4. Determination of tensile strength and percentage elongation of the given metal specimen
5. Determination of compressive strength of the given specimen.
6. Determination of torsional strength and modulus of rigidity for metals
7. Determination of spring index of the given helical coil spring
8. Experiment on deflection of beam
9. Performing creep test of the given specimen
10. To perform the buckling of column under different end conditions.

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	28-05-2022
Date of approval by the Academic Council	20/10/2022

Course Outcome for CE3344

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to perform test to determine mechanical properties of soil	3	S
CO2	Students should be able to perform test to determine strength of soil	3	S
CO3	Students should be able to perform test to determine water content of soil sample	3	En
CO4	Students should be able to perform test to determine Index property of soil sample	3	En
CO5	Students should be able to perform test to determine Specific gravity of different soil sample	3	En

CO-PO Mapping for CE3344

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	1	2	1	3	3	2	3	2	3	1	2	1	1	3
CO 2	1	3	1	2	1	3	3	1	2	1	2	2	1	2
CO 3	3	2	3	1	1	2	3	1	2	2	2	1	2	3
CO 4	1	2	1	3	3	1	3	1	1	3	2	3	3	2
CO 5	1	2	2	2	2	2	2	2	3	2	1	2	1	1
Avg.	1.4	2.2	1.6	2.2	2	2	2.8	1.4	2.2	1.8	1.8	1.8	1.6	2.2

HU3202	**Title: United Nations Development Programme**	**L T P C** **1 0 0 1**
Version No.	**1.0**	
Course Prerequisites	Nil	
Objectives		
Unit Nos.	**Unit Title**	**Number of hours (Per Unit)**
Unit 1	**Introduction**	2
Introduction to UNDP, Mission and Vision of UNDP, Goals of UNDP, Structure of UNDP Executive Board and function of UNDP Board members, Expertise of UNDP, UNDP in India: Projects of UNDP in India.		
Unit 2	**Sustainable Livelihoods**	3
Vision and Strategy for Sustainable Livelihoods: Hill Agriculture / Horticulture, Tourism and Other avenues for generating Sustainable Livelihoods. Strategies for End of hunger, achieve food security and improved nutrition and promote sustainable agriculture Promote Sustained, Inclusive and Sustainable Economic Growth, Full and Productive Employment and Decent Work for All. Build Resilient Infrastructure, Promote Inclusive and Sustainable Industrialization and Foster Innovation		
Unit 3	**Human Development**	2
Access and explore human development data for 191 countries and territories worldwide. Ensure healthy lives and promote well-being for all at all ages, Ensure Inclusive and Equitable Quality Education and Promote Lifelong Learning Opportunities, Ensure availability and sustainable management of water and sanitation.		
Unit 4	**Social Development**	2
Achieve Gender Equality and Empower All Women and Girls, Reduce Inequality within and Among Countries, Promote Peaceful and Inclusive Societies for Sustainable Development, Provide Access to Justice to All and Build Effective, Accountable and Inclusive Institutions at All Levels		
Unit 5	**Environmental Sustainability**	3
Ensure access to affordable, reliable, sustainable and modern energy, Make Cities and Human Settlements Inclusive, Safe, Resilient and Sustainable, Ensure Sustainable Consumption and Production Patterns, Urgent Action to Combat Climate Change and its Impacts, Protect, Restore and Promote Sustainable Use of Terrestrial Ecosystems, Sustainably Manage Forests, Combat Desertification, and Halt and Reverse Land Degradation and Halt Biodiversity Loss.		
Text Books		
Reference Books	http://web.undp.org/evaluation/documents/Books/Evaluation_for_Agenda_2030.pdf Digambar Bhouraskar, 2014, United Nations Development Aid: A History of Undp, Academic Foundation Publisher, 230	
Mode of Evaluation	Internal and External Examination	
Recommended by the Board of Studies on	28-05-2022	
Date of approval by the Academic Council on	20/10/2022	

Course Outcome for HU3202

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp.)/ Skill(S)/ Entrepreneurship (Ent.)/ None (*Use , for more than One*)
CO1	Students will learn about the Structure, Mission, Vision and Goals of UNDP	2	S
CO2	Equip the students with the knowledge of sustainable livelihoods for inclusive economic growth.	2	S
CO3	Students will learn and explore about the Human Development index to promote wellbeing at all ages.	2	S
CO4	To impart better education on SDGs goals focusing on Gender Equality and Provide Access to Justice to All and Build Effective.	3	N
CO5	Students will develop knowledge regarding environment sustainability.	3	N

CO-PO Mapping for HU3202

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	1	2	3	3	3	3	2	2	3	2	3	2	1	2
CO 2	1	3	2	0	1	3	0	3	3	2	0	0	1	3
CO 3	1	3	0	2	0	0	2	1	1	1	0	1	1	3
CO 4	2	3	1	1	1	0	1	2	2	0	0	2	2	3
CO 5	3	3	2	3	2	1	3	0	0	2	2	1	3	3
Avg.	1.6	2.8	1.6	1.8	1.4	1.4	1.6	1.6	1.8	1.4	1	1.2	1.6	2.8

VP3301	Title:Value Added Program-III	L T P C 1 0 2 2
Course Prerequisites	**VP3201**	
Objectives	• To enhance holistic development of students and improve their employability skills. • To develop the Personality of students with major emphasize on English Communication. • To enable them to communicate and present effectively in front of others and nurture their speaking skills in English. • To inculcate in our students the ability to develop soft skills and professional etiquettes which will make them more suitable for jobs in the corporate sector. • To motivate students to overcome interactional phobia and to develop professional etiquette along with conversational skills.	
Expected Outcome	• This course will help them to enrich their English communication which will help students to become successful in his or her career pursuits. • They will be able to take part in daily routine conversations in English. • Students will be able to understand and be partially groomed in corporate etiquettes and culture	
Unit No.	**Unit Title**	**No. of hour(per Unit)**
Unit I	**Speaking Skills**	12
• Describe yourself, your educational background, family, hobbies, strengths • Let's talk- making conversation, meeting and greeting people • Extempore • Short Speech • Group Discussion • Presentation • Situational Conversation • Story Telling • Debate • Pronunciation		
Unit II	**Reading and Writing**	10
• Resume Writing, Cover letter • Success Stories • Passage Reading, Newspaper Reading • E-mail etiquettes: Simple e-mail or letter including expressions for greeting, addressing, asking or thanking		
Unit III	**Personality Enhancement**	8
• Body Language: Eye Contact, Facial Expressions, Gestures, Postures, Body Movements • First impression: Dressing sense, good manners, speaking well and respectably • Positive Attitude: Being happy and alert, a good listener and a good friend • Goal setting, confidence building and handling rejection, SWOT analysis • Self-Management Skills: Anger Management		
Unit IV	**Vocabulary Development**	4

• Word Formation: Prefix, suffix, conversion and compound words • Homophones and one-word substitution • Words often confused and misused • Idiomatic phrases • Antonyms and synonyms • Vocabulary on theme (e.g. shopping, travelling)		
Unit V	**Listening**	6
• Main point in short simple conversations and messages • Essential information in short recorded passages on diverse matters		
Text Books	1. Personality development by Harold R. Wallace (Cengage Learning)	
Reference Books	1. Practical English Usage by Michael Swan (Oxford) 2. Personality Development & Soft skills by Barun K. Mitra; 2nd edition (Oxford Univ. Press) 3. **Online Resources:** Flipboard, TEDx, Youtube	
Mode of Evaluation		
Recommendation by Board of Studies on	28-05-2022	
Date of approval by the Academic Council	20/10/2022	

Course code	**VP3301**
Paper Title	**Value Added Program-III**
CO1	After the course the students will be able to write/understand and create sentences in English of all tenses, Students will heighten their awareness of correct usage of English grammar in writing and speaking and will be able to improve their speaking ability in English both in terms of fluency and comprehensibility.
CO2	Students will be able to take part in daily routine conversation in English.
CO3	Students will be able to understand and partially be groomed in corporate etiquettes and culture

CO4	This course will aid the students to learn new vocabulary words, use them correctly in a sentence while speaking and writing, , and understand their meaning in the text
CO5	The students will learn to use strategies to listen actively, will be able to distinguish more important ideas from less important ones and will participate in the discussions.

SEMESTER 4

CE3403	Title: **Structural Analysis**	L T P C 3 2 0 4
Version No.	**1.0**	
Course Prerequisites	**Nil**	
Objectives	An understanding of the basic behavior of skeletal structures and their response to applied loading with emphasis on development of analytical and intuitive skills.	
Unit No.	**Unit Title**	**No. of hours (per Unit)**
Unit: I	**Beams**	3
Analysis of beams using Moment Area Method, Conjugate Beam Method and unit load method.		
Unit II	**Energy Principle**	3
Strain energy method as applied to the analysis of redundant frames and redundant trusses up to two degrees. Williot-Mohr diagram, Castiglione's theorem, Maxwell's reciprocal theorem, Betti's theorem		
Unit III	**Truss and Frames**	6
Introduction and different methods of solving trusses and frames. Method of joints and Method of section, Determination of deflection of trusses,		
Unit IV	**Arches**	6
Arches as structural forms, Types of arch, Analysis of two hinged, Three hinged, Fixed, Circular and Parabolic		
Unit V	**Influence Line**	6
Influence line diagram of determinate and indeterminate structures like trusses, beams and portal frames.		
Text Books	1. Krishnamurthy D., "Theory of Structures", J.K. Jain Brothers,	
Reference Books	1. Rajsekaran S., Shankarasubramanian G. "Computational of Structural Mechanics", Prentice Hall of India Pvt. Ltd., New Delhi, 2001	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by the Academic Council	20/10/2022	

Course Outcome for CE3403

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	To perform analysis of determinate structures.	4	S
CO2	To understand the fundamental concepts and theorems for analysis of structures.	4	S
CO3	To perform analysis of trusses and frames using various conventional methods.	4	En
CO4	To analyze typical structures such as three hinged arch and two hinged arches.	4	En
CO5	To draw influence line diagrams for beams, girders, frames and indeterminate structures.	4	En

CO-PO Mapping for CE3403

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	1	2	3	3	2	1	2	1	3	2	3	3	1	2
CO 2	3	2	2	1	2	3	2	1	1	2	1	1	1	3
CO 3	3	2	2	2	3	3	2	2	1	1	2	3	1	3
CO 4	1	2	2	1	3	3	1	2	1	2	3	1	1	2
CO 5	2	2	1	2	1	1	3	2	1	1	3	1	2	3
Avg.	2	2	2	1.8	2.2	2.2	2	1.6	1.4	1.6	2.4	1.8	1.2	2.6

CE3407	Title: **Environmental Engineering**	L T P C 2 0 0 2
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To provide information of various sources and characteristics of wastewater various treatment methods available for wastewater treatment	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	**Wastewater CollectionCharacterization**	6
Plumbing, Types of sewers, Design considerations, Construction & maintenance, Storm water sewers, Constituents of waste water. Problems in land and hills		
Unit II	**Wastewater Treatment & Pre-and Primary Treatment**	6
On site and centralized treatment systems. Screen, Grit removal, Oil and grease removal. Problems in land and hills		
Unit: III	**Secondary Treatment**	6
Activated sludge process, conventional and extended aeration, waste stabilization ponds, UASB process, UASB post treatment. Problems in land and hills		
Unit IV	**Wastewater and sludge Disposal**	6
Reuse systems, wastewater disposal on land and water bodies, and disposal of sludge. Problems in land and hills		
Unit V	**Municipal Solid Waste**	6
Collection, characterization, transport, treatment & disposal. Problems in land and hills		
Text Books	1. Davis, M.L. And Cornwell, D.A., "Introduction to Environmental Engineering", McGraw Hill. 2. Master, G.M., "Introduction to Environmental Engineering and Science", Prentice Hall of India.	
Reference Books	1. Peavy, H.S., Rowe, D.R. And Tchobanoglous, G., "Environmental Engineering", McGraw Hill. 2. Arcievala, S.J., "Wastewater Treatment for Pollution Control", Tata McGraw Hill.	
Mode of Evaluation	Internal and External Examination	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by the Academic Council	20/10/2022	

Course Outcome for CE3407

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to understand the types of sewer and its design consideration	3	S
CO2	Students should be able to understand the concept of waste water treatment (Primary Treatment	3	S
CO3	Students should be able to understand the concept of waste water treatment (Secondary Treatment)	3	En
CO4	Students should be able to understand the disposal of waste water on land and water bodies	3	En
CO5	Students should be able to understand the collection, transportation and treatment of municipal solid waste	3	En

CO-PO Mapping for CE3407

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	1	2	1	3	3	2	3	2	3	1	2	1	1	3
CO 2	1	3	1	2	1	3	3	1	2	1	2	2	1	2
CO 3	3	2	3	1	1	2	3	1	2	2	2	1	2	3
CO 4	1	2	1	3	3	1	3	1	1	3	2	3	3	2
CO 5	1	2	2	2	2	2	2	2	3	2	1	2	1	1
Avg.	1.4	2.2	1.6	2.2	2	2	2.8	1.4	2.2	1.8	1.8	1.8	1.6	2.2

CE3408	Title: **Soil Mechanics**	L T P C 3 2 0 4
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	Describe the nature of soil problems encountered in civil engineering and give an overall preview of the behavior of soil.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit: 1	**Introduction and Properties of Soil**	8
Soil formation, Soil types, composition, Constituents of soil and representation by three phase diagram, Definitions of void ratio, Porosity, Water content, Degree of saturation, Specific gravity, Unit weight, Bulk density/bulk unit weight, Dry unit weight, Saturated unit weight and submerged unit weight of soil grains and correlation between them.		
Unit II	**Soil Classification,**	8
Particle size, shape and their effect on engineering properties of soil, Particle size classification of soils- Unified soil classification system, IS soil classification system, field identification tests.		
Unit III	**Permeability and Seepage Analysis**	8
Darcy's law, determination of permeability, equivalent permeability in stratified soils, in situ permeability test, 1-D flow, Laplace's equation, flow nets, seepage, uplift pressure, confined and unconfined flows. (Problems in land and hills)		
Unit IV	**Compaction, Compressibility And Consolidation**	8
General principles of compaction, dry density –water content relationship, compaction tests, factors affecting compaction, field compaction techniques. Fundamentals, 1-D consolidation, normally and over-consolidated clays, void ratio – pressure relationships, compressibility characteristics, time rate of consolidation, coefficient of consolidation, curve fitting techniques, secondary consolidation. (Problems in land and hills)		
Unit V	**Shear Strength, Slopes Analysis**	8
Principle of effective stress, Mohr-Coulomb failure criterion, direct shear test, unconfined compression test, Tri-axial shear test : consolidated drained, consolidated undrained, unconsolidated undrained, vane shear test, mode of slopes failure mechanism, stability analysis of infinite slopes, Taylor's stability number. (Problems in land and hills)		
Text Books	1. Ranjan, G. and Rao, A.S.R., "Basic and Applied Soil Mechanics", New Age International Publishers. 2. Dr. B.C. Punmia, Er. Ashok K.Jain and Dr. Arun K. Jain " Soil Mechanics And Foundation Engineering:	
Reference Books	1. Holtz, R.D. and Kovacs, W.D., "An Introduction to Geotechnical Engineering", Prentice Hall. 2. Das, B.M., "Principles of Geotechnical Engineering", Thomson Asia. 3. Mittal, S. . Soil Testing for Engineers 4. Mittal, S. Pile Foundation Design and Construction.	
Mode of Evaluation	Internal and External Examination	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by	20/10/2022	

the Academic Council	

Course Outcome for CE3408

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to understand the properties of soil	3	S
CO2	Students should be able to understand the soil classification and permeability and seepage analysis	3	S
CO3	Students should be able to understand the compaction, consolidation and compressibility on soil	3	En
CO4	Students should be able to analyze the shear strength of soil	3	En
CO5	Students should be able to understand the concept of shear strength, slope of soil structure	3	En

CO-PO Mapping for CE3408

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	3	2	2	1	3	2	2	3	2	2	2	2	2
CO 2	1	1	1	2	2	3	3	1	3	1	2	3	2	1
CO 3	1	1	3	2	2	3	1	2	1	1	2	3	3	3
CO 4	1	3	3	2	3	2	1	3	3	3	2	2	3	2
CO 5	1	3	2	1	3	1	2	2	1	1	2	3	3	1
Avg.	1.2	2.2	2.2	1.8	2.2	2.4	1.8	2	2.2	1.6	2	2.6	2.6	1.8

CE3409	Title:**Basics of Ground Surveying**	L T P C 3 0 0 3
Version No.	**1.0**	
Course Prerequisites	**Nil**	
Objectives	To prepare a map or plan to represent an area on a horizontal plan.	
Unit No.	**Unit Title**	**No. of hours (per Unit)**
Unit: 1	**Introduction to Surveying**	3
Definition, Divisions, Classification and Principles of surveying. Scales: plain, Vernier, diagonal, plan and map.		
Unit II	**Linear Measurement**	3
Chain and Tape surveying, Types of chain and tape, ranging, obstacles and tape correction.		
Unit III	**Leveling**	6
Methods of determining elevations, Direct levelling- Basic terms and definitions, Principle, Booking and Reduction of field notes, Curvature and refraction correction, use of Automatic level, Digital Level, Vertical Control.		
Unit IV	**Angular Measurement**	6
Theodolite survey: Measurements of horizontal and vertical angles, Horizontal Control, Working of Electronic Theodolites. Tachometry: Principles of stadia systems, Sub tense bar and tangential methods.		
Unit V	**Curves**	6
Elements of simple circular curves, Theory and methods of setting out simple circular curves, Transition curves-types and their characteristics, Ideal transition curve, Equations of various transition curves, Introduction to vertical curves. Survey Layout for culverts, Canals, Bridges, Road/Railway alignment and Buildings.		
Text Books	1. BC Punmia et al: Surveying Vol. I, II, Laxmi Publication	
Reference Books	1. SK Duggal: Surveying Vol. I, II. 2. R Subramanian : Surveying and Leveling , Oxford University Press	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by the Academic Council	20/10/2022	

Course Outcome for CE3406

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to understand basics of surveying	4	S
CO2	Students should be able to understand linear measurements	4	S
CO3	Students should be able to understand leveling methods in surveying	4	En
CO4	Students should be able to perform angular measurements	4	En
CO5	Students should be able to understand curves and its formations	3	En

CO-PO Mapping for CE3406

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	1	1	1	2	1	3	3	1	2	3	3	1	1	3
CO 2	3	3	1	2	1	1	3	3	2	3	1	2	2	2
CO 3	1	1	3	3	2	1	1	1	1	3	1	3	3	3
CO 4	1	2	3	3	2	3	3	1	1	2	2	3	3	2
CO 5	2	3	2	1	3	3	3	3	3	3	2	2	1	3
Avg.	1.6	2	2	2.2	1.8	2.2	2.6	1.8	1.8	2.8	1.8	2.2	2	2.6

CE3442	Title:Structural Analysis Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To impart experimental knowledge of structural members under loading	

List of Experiments

1. Analysis the redundant Joint
2. To determine Elasticity coupled beam
3. To determine Deflection of truss
4. To determine horizontal thrust of three hinged arch
5. To analysis a fixed Beam
6. To determine horizontal thrust of Two hinged arch
7. To determine Elastic properties of deflected beam apparatus
8. To determine buckling of Column with different end conditions
9. To analysis the Portal frame Apparatus
10. Analysis the Curved Member
11. To determine deflection of cantilever beam
12. To determine deflection of simply supported beam

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	28-05-2022
Date of approval by the Academic Council	20/10/2022

Course Outcome for CE3442

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to analysis beams BY MAXWELL theorem	4	S
CO2	Students should be able to analysis column	4	S
CO3	Students should be able to analysis truss	4	En
CO4	Students should be able to analysis of arch	4	En
CO5	student will able to analyses the elastic deformation of curved beam	4	En

CO-PO Mapping for CDE3442

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	1	2	1	1	1	3	3	2	2	2	2	2	3	1
CO 2	2	1	3	2	2	2	1	1	1	3	2	1	2	3
CO 3	3	1	1	3	1	3	2	3	3	1	3	1	1	2
CO 4	1	1	1	1	1	1	2	2	1	3	3	3	3	3
CO 5	3	3	1	2	1	2	1	1	2	3	3	2	1	1
Avg.	2	1.6	1.4	1.8	1.2	2.2	1.8	1.8	1.8	2.4	2.6	1.8	2	2

CE3446	Title: **Environmental Engineering Lab**	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To equip the students in doing analysis of water and wastewater samples.	

List of Experiments

1. To determine turbidity of water sample.
2. To determine dissolved oxygen of given sample.
3. To determine pH value of water.
4. To perform jar test for coagulation.
5. To determine BOD of given sample.
6. To determine residual chlorine in water.
7. To determine conductivity of water and total dissolved solids.

Recommendation by Board of Studies on	28-05-2022
Date of approval by the Academic Council	20/10/2022

Course Outcome for CE3446

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to determine water quality parameters physically	4	S
CO2	Students should be able to determine the water quality parameters chemically	4	S
CO3	Students should be able to analyze the water quality parameters biologically	4	En
CO4	Students should able to identify the factors adversely affecting the quality of water	4	En
CO5	Students should able to understand the methods adopted to treat the water	3	En

CO-PO Mapping for CE3446

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	1	2	3	3	2	1	2	1	3	2	3	3	1	2
CO 2	3	2	2	1	2	3	2	1	1	2	1	1	1	3
CO 3	3	2	2	2	3	3	2	2	1	1	2	3	1	3
CO 4	1	2	2	1	3	3	1	2	1	2	3	1	1	2
CO 5	2	2	1	2	1	1	3	2	1	1	3	1	2	3
Avg.	2	2	2	1.8	2.2	2.2	2	1.6	1.4	1.6	2.4	1.8	1.2	2.6

CE3447	Title: **Soil Mechanic Lab**	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To impart basic knowledge on properties of soil and strength characteristics as well.	

List of Experiments

1. Determination Specific Gravity of Coarse and Fine Grained Soils
2. To Find Particle Size Distribution of coarse grained soil using Mechanical Analysis.
3. To Find Particle Size Distribution of fine grained soil using Hydrometer Analysis.
4. Determination of Mechanical property of soil
5. Determination of water content- dry density relation using light Proctor Compaction Test
6. Determination of In Situ dry density of soil using Sand Replacement Method.
7. Determination of In Situ dry density of soils using Core Cutter Method.
8. To Perform Permeability Test.
9. Determination of the Shear Strength Parameters of soil using Direct Shear Test.

Recommendation by Board of Studies on	28-05-2022
Date of approval by the Academic Council	20/10/2022

Course Outcome for CE3445

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to analyze the different properties of soil	4	S
CO2	Students should be able to analyze the types of the soil using different methods	4	S
CO3	Students should perform the proctor test	4	En
CO4	Students should be able to analyze the shear strength of soil	4	En
CO5	Students should perform the aggregate impact value test	4	En

CO-PO Mapping for CE3445

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	1	2	1	1	1	3	3	2	2	2	2	2	3	1
CO 2	2	1	3	2	2	2	1	1	1	3	2	1	2	3
CO 3	3	1	1	3	1	3	2	3	3	1	3	1	1	2
CO 4	1	1	1	1	1	1	2	2	1	3	3	3	3	3
CO 5	3	3	1	2	1	2	1	1	2	3	3	2	1	1
Avg.	2	1.6	1.4	1.8	1.2	2.2	1.8	1.8	1.8	2.4	2.6	1.8	2	2

CE3448	Title: **Basics Ground Surveying Lab**	L T P C 0 0 2 1
Version No.	**1.0**	
Course Prerequisites	**Nil**	
Objectives	To develop methods through the knowledge of modern science and the technology and use them in the field.	

List of Experiments

1. To prepare conventional symbol chart based on the study of different types of topographical maps.
2. To measure bearings of a closed traverse by prismatic compass and to adjust the traverse by graphical method.
3. To find out reduced levels of given points using Auto/dumpy level.
4. To perform fly leveling with Auto/tilting level.
5. To study parts of a Vernier theodolite and measurement of horizontal and vertical angle.
6. To measure horizontal angle between two objects by repetition/reiteration method.
7. To determine the height of a vertical structure (e.g. chimney/ water tank etc.) using trigonometrically leveling by taking observations in single vertical plane.
8. To study various parts of Electronic Theodolite,
9. Total Station and practice for measurement of distance, horizontal and vertical angles.
10. To set out a simple circular curve by Rankine's method.
11. To exercise two point and three point problem using plane table surveying
12. To prepare contour map

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	28-05-2022
Date of approval by the Academic Council	20/10/2022

Course Outcome for CE3448

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to perform leveling and can find horizontal and vertical angles using surveying instruments	4	S
CO2	Students should be able to plot traverse and contours.	4	S
CO3	Students should be able to understand leveling methods in surveying	4	En
CO4	Students should be able to perform angular measurements	4	En
CO5	Students should be able to understand curves and its formations	4	En

CO-PO Mapping for CE3448

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	2	1	1	1	3	2	3	1	3	2	3	2	1
CO 2	2	1	1	3	2	3	1	3	3	2	2	2	3	2
CO 3	1	3	2	1	3	3	1	3	2	1	3	1	1	2
CO 4	3	2	1	1	1	2	1	3	2	1	3	1	3	1
CO 5	2	2	1	3	3	1	2	2	2	2	1	3	1	3
Avg.	2	2	1.2	1.8	2	2.4	1.4	2.8	2	1.8	2.2	2	2	1.8

VP3401	Title:PDP for Managers III	L T P C 10 2 2
Objectives	• To develop the English communication skills of our students. • To enable them to communicate effectively and nurture their speaking skills in English. • To inculcate in our students, the ability to develop soft skills and professional etiquettes which will make them more suitable for jobs in the corporate sector. • To overcome interaction phobia as English is not their mother tongue.	
Expected Outcome	• After the Course, the students will be able to write/understand and create sentences in English of all tenses. • They will be able to take part in daily routine conversations in English. • Students will be able to understand and be partially groomed in corporate etiquettes and culture	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Communication and Cognitive Grammar	4
• Functions of communication& its implementation in contemporary world. • Process of Communication • Organizational communication and behavior • Parts of speech and their usage		
Unit II	Speaking& Listening Skills	4
Introduction • Describe yourself, your educational background, family, hobbies, strengths • Let's talk- making conversation, meeting and greeting people • Opinions, likes and dislikes **World Around Me** • Life at college, hostel etc. • Market place, bus stop, bank, post office • Village, town and city • Eating out at a Restaurant **Grab the information** • Main point in short simple conversations and messages • Essential information in short recorded passages on diverse matters		
Unit III	Personality Enrichment	4
• First impression: Dressing sense, good manners, speaking well and respectably • Positive Attitude: Being happy and alert, a good listener and a good friend • Goal setting, confidence building and handling rejection • Group Discussion • Corporate Etiquettes		
Unit IV	Group Discussion and Body Language	4
• Group discussion and its significance • Qualities assessed during group discussion • Why GD is contemporary way to shortlist the candidate? • Haptics, Kinesics, Oculesics • Importance of Body Language and its usage		

Unit V	Training and PIs	4
• Leadership • Interpersonal relation • Stress management • Group dynamics and team building • Personal interviews with intrinsic & extrinsic approach.		
Books	5. Wren & Martin revised by Dr. N.D.V.Prasad Rao (S.Chand) 6. Personality development by Harold R. Wallace (Cengage Learning) 7. The power of positive thinking (Norman Vincent Peale) 8. **Body language:**ShaliniVerma	
Reference Books	4. Essential English grammar by Raymond Murphy (Cambridge Univ. Press) 5. Practical English Usage by Michael Swan (Oxford) 6. Personality Development & Soft skills by Barun K. Mitra; 2nd edition (Oxford Univ. Press) 7. **Online Resources:** Flipboard, TEDx, Youtube	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by the Academic Council	20/10/2022	

Course Outcome for VP3401

Course code	**VP3401**
Paper Title	**PDP for Managers III**
CO-1	This program lead to improve numerical skills of the students to do calculative part in short period of time.
CO-2	Understanding of directions, blood relations, ranking, coding-decoding, calendar, clock enhance the analyzing power of students.
CO-3	Understanding how a person efficiency impact on TIME AND WORK, And let to know the power of compounding in COMPUND INTEREST, also Know about the percentage calculation in various aspects.
CO-4	Calculate Time Speed and Distance in various aspects, how Selling price and Cost price lead to profit or lose.
CO-5	With the help of this student can qualify for various competitive exams (BANK, SSC, POLICE, DEFENCE, ETC.) This will be helpful for written exam of various companies.

SEMESTER 5

CE3501	Title: **Advance Structural Analysis**	L T P C **2 2 0 3**
Version No.	1.0	
Course Prerequisites	**CE3403**	
Objectives	To provide information of fundamental issues in these advanced topics in structural analysis, besides enjoying the learning process, developing analytical and intuitive skills.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	**Moment Distribution Method**	8
Analysis of Beams and Portal frames using moment distribution method.		
Unit II	**Slope Deflection Method**	8
Analysis of Beams and Portal frames slope deflection method.		
Unit: III	**Flexibility Matrix Method**	8
Concept of static indeterminacy of structures, Formulation of Flexibility matrix and equations applied to simple trusses and continuous beams. Flexibility matrix for non-prismatic members		
Unit IV	**Stiffness Matrix Method**	8
Concept of kinematics indeterminacy of structures, Formulation of stiffness matrix and equations applied to simple trusses and continuous beams. Stiffness matrix method applied to simple plane frames.		
Unit V	**Plastic Analysis**	8
Plastic analysis of beams and frames (Static and kinematic method)		
Text Books	1. DevdasMenon, "Advanced Structural Analysis", Narosa Publishing House,	
Reference Books	3. AsslamKassimali, "Matrix Analysis of Structures. 4. Amin Ghali, Adam M Neville and Tom G Brown, "Structural Analysis: A Unified Classical and Matrix Approach"	
Mode of Evaluation	Internal and External Examination	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by the Academic Council	20/10/2022	

Course Outcome for CE3501

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to analyze the beam & portal frames using moment distribution method.	3	S
CO2	Students should be able to analyze the beam & portal frames using slope deflection method.	3	S
CO3	Students should be able to analyze the beam & trusses using flexible matrix method.	3	S
CO4	Students should be able to analyze the beam & trusses using stiffness matrix method.	3	S
CO5	Students should be able to analyze the beam & frames using plastic analyzes.	3	S

CO-PO Mapping for CE3501

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	1	3	1	1	3	3	1	1	3	3	3	2	3	2
CO 2	2	2	1	2	2	2	1	1	1	1	3	2	3	3
CO 3	2	2	2	2	3	3	3	3	1	2	2	2	1	1
CO 4	2	3	3	2	3	2	2	2	1	3	2	3	1	1
CO 5	2	2	1	3	3	3	1	3	2	2	1	1	3	1
Avg.	1.8	2.4	1.6	2	2.8	2.6	1.6	2	1.6	2.2	2.2	2	2.2	1.6

CE3503	Title: **Design of Steel Structures**	L T P C 2 2 0 3
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	To introduce the limit state design of steel structural components subjected to bending, compression and tensile loads including the connections.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	**Introduction**	8
Properties of steel, Structural steel sections, Limit State Design Concept, Loads on Structures, Connections using bolting, Welding, and Design of bolted and welded joints, Eccentric connections.		
Unit II	**Tension Members**	8
Types of section, Net area, Net effective sections for angles and Tee in tension. Design of connections in tension members		
Unit: III	**Compression Members**	8
Compression members, Struts and Columns		
Unit: IV	**Roof Trusses**	8
Roof trusses, roof & side coverings, Design loads, Purlins, members, endbearings.		
Unit V	**Beam & Column**	8
Beam column, Stability consideration, Interaction formulae, Column bases, Slab base, Gusseted base and grillage footings.		
Text Books	1. N. Subramanian., "Steel Structures: Design and Practice", Oxford. 2. Duggal, S.K., "Design of Steel Structures", Tata McGraw-Hill.	
Reference Books	1. Arya, A.S. and Ajmani, J.L., "Design of Steel Structures", Nem Chand & Bros.	
Mode of Evaluation	Internal and External Examination	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by the Academic Council	20/10/2022	

Course Outcome for CE3503

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	The students will be able to understand the concept of designing of bolted and welded connections.	4	Em
CO2	The students will be able to analyze tension members and beams using the IS specifications.	3	Em
CO3	The students will be able to analyze compression member.	3	S
CO4	The students will be able to analyze columns under axial loads using IS specifications.	3	S
CO5	The students will be able to analyze roof truss and beam and column.	3	S

CO-PO Mapping for CE3503

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	2	3	1	3	1	1	3	2	1	1	1	2	3
CO 2	1	3	3	1	1	3	2	2	3	2	2	1	1	1
CO 3	3	2	2	2	1	1	1	1	1	1	2	3	2	2
CO 4	1	3	3	3	3	3	3	2	1	3	2	3	3	1
CO 5	1	1	2	1	3	3	2	2	1	1	2	2	3	1
Avg.	1.8	2.2	2.6	1.6	2.2	2.2	1.8	2	1.6	1.6	1.8	2	2.2	1.6

CE3504	Title: **Transportation Engineering**	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	Students will obtain a basic understanding of transportation engineering principles including historical development of transportation in the India and different traffic aspect.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit: I	**Highway**	6
Introduction and Fundamentals of Transportation System. ,Development & Planning of Road transport Materials used in highway construction, Geometric Design, rigid pavement and flexible pavement		
Unit II	**Traffic Engineering**	6
Traffic Engineering &Studies, Traffic Capacity analysis, Traffic Design ,Traffic Control Devices ,Traffic Regulation & Management ,Traffic Flow theory		
Unit III	**Railway-I**	6
Railway Transportation and its development, Railway terminology, Railway Administration and Management. Traction and tractive Resistance. Permanent Way. Rail types and functions, Sleepers Ballast cushion, Ballast section Rail fixtures and fasteners. Geometric design of railway track.		
Unit IV	**Railway-II**	6
Points & crossings, railway track Junctions. Stations and Yards, Railway signaling and interlocking, track circuiting. Railway track construction, Signaling and Controlling		
Unit V	**Airport And Harbor**	6
Development of Air Transportation in India. Aircraft components and characteristics Imaginary surfaces, Approach and Turning zone, clear zone, vert. Clearance for Highway & Railway. Runway and taxiway design Docks and Harbor: Importance, Sea and tides, tidal theories, tide table, wind waves and Cyclones, harbor layout, break waters, jetties and moorings.		
Text Books	1. Khanna And Justo, “Transportation engineering”	
Reference Books	1. J H Banks,“Introduction to Transportation Engineering” 2. P H Wright and K Dixon ,“Highway Engineering”	
Mode of Evaluation	Internal and External Examination	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by the Academic Council	20/10/2022	

Course Outcome for CE3504

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to understand the fundamentals of transportation system.	2	S
CO2	Students should be able to analyze the traffic capacity.	3	S
CO3	Students should be able to understand the railway transportation system.	2	S
CO4	Students should be able to understand the railway track junctions and crossings.	2	S
CO5	Students should be able to understand the Airport &Harbors Engineering.	2	S

CO-PO Mapping forCE3504

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	1	3	2	3	1	3	3	1	2	3	3	3	1	3
CO 2	1	1	2	1	3	3	2	2	3	1	2	3	1	3
CO 3	1	2	1	1	3	2	3	2	3	2	1	2	2	3
CO 4	2	3	1	1	2	2	3	2	1	1	2	2	1	2
CO 5	2	1	3	2	1	3	1	1	3	1	1	2	1	1
Avg.	1.4	2	1.8	1.6	2	2.6	2.4	1.6	2.4	1.6	1.8	2.4	1.2	2.4

CE3508	Title: **Design of Reinforced Cement Concrete Structures**	**L T P C** **3 2 0 4**
Version No.	**1.0**	
Course Prerequisites	**Nil**	
Objectives	The design of Basic elements such as slab, beam, column and footing which form part of any structural system with reference to IS codes.	
Unit No.	**Unit Title**	**No. of hours (per Unit)**
Unit: 1	**Methods of Design of Concrete Structures**	3
Concept of Elastic method, ultimate load method and limit state method – Advantages of Limit State Method over other methods – Design codes and specification – Limit State philosophy as detailed in IS code – Design of beams and slabs by working stress method.		
Unit II	**Limit State Design for Flexure**	6
Analysis and design of singly and doubly reinforced rectangular and flanged beams - Analysis and design of one way, two way and continuous slabs subjected to uniformly distributed load for various boundary conditions.		
Unit III	**Limit State Design for Bond, Anchorage Shear and Torsion**	6
Behaviour of RC members in bond and Anchorage - Design requirements as per current code - Behavior of RC beams in shear and torsion - Design of RC members for combined bending shear and torsion.		
Unit IV	**Limit State Design of Columns**	3
Types of columns – Braced and unbraced columns – Design of short Rectangular and circular columns for axial, uniaxial and biaxial bending.		
Unit V	**Limit State Design of Footing**	6
Design of wall footing – Design of axially and eccentrically loaded rectangular pad and sloped footings – Design of combined rectangular footing for two columns only.		
Text Books	1. Krishna Raju, N., "Design of Reinforced Concrete Structures", CBS Publishers and Distributors,NewDelhi, 2. Jain, A.K., "Limit State Design of RC Structures", Nemchand Publications, Rourkee	
Reference Books	1. Sinha, S.N., "Reinforced Concrete Design", Tata McGraw-Hill Publishing Company Ltd.,New Delhi. 2. Unnikrishna Pillai, S., DevdasMenon, "Reinforced Concrete Design", Tata McGraw-HillPublishing Company Ltd., New Delhi	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by the Academic Council	20/10/2022	

Course Outcome for CE3508

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to design the portal frame	3	S
CO2	Students should be able to design the continuous beam	3	S
CO3	Students should be able to design the different types of water tank	3	S
CO4	Students should be able to design the combined footing and its type	3	S
CO5	Students should be able to design the retaining wall and its types	3	S

CO-PO Mapping for CE3508

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	1	2	2	2	2	1	2	2	2	1	1	2	1	3
CO 2	3	3	3	1	3	2	2	1	2	1	3	1	2	1
CO 3	2	3	3	2	2	1	2	3	1	2	3	3	1	2
CO 4	3	2	3	1	3	3	1	2	3	3	2	1	3	2
CO 5	3	1	1	3	1	1	2	2	3	3	2	2	2	2
Avg.	2.4	2.2	2.4	1.8	2.2	1.6	1.8	2	2.2	2	2.2	1.8	1.8	2

CE-3542	Title: **Transportation Engineering Lab**	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To impart basic knowledge of strength of materials used for road construction	

List of Experiments

1. Los Angeles abrasion value for given aggregate sample
2. To find the Impact value of given aggregate.
3. To determine the aggregate crushing value of coarse aggregate.
4. To find the Flash and fire point for the given bitumen sample.
5. Determination of softening point of Bitumen.
6. To find out the Ductility of a given sample of Bitumen.
7. To determine the grade of given binder (penetration test).
8. To determine the elongation index of a given Aggregate sample.
9. To determine the flakiness index of a given Aggregate sample.
10. To determine the viscosity of bitumen binder.
11. To perform marshal stability test on a given sample
12. Study the plate load test on a pile foundation used in highway

Recommendation by Board of Studies on	28-05-2022
Date of approval by the Academic Council	20/10/2022

Course Outcome for CE3542

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to perform various tests on aggregate.	3	S
CO2	Students should be able to perform various tests on bituminous material.	3	S
CO3	Students should able to determine the aggregate crushing value of coarse aggregate.	3	S
CO4	Students should able to determine find the Flash and fire point for the given bitumen sample.	3	S
CO5	Students should determination of Softening point of Bitumen and viscosity of bitumen binder..	3	S

CO-PO Mapping for CE3542

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	3	3	1	1	2	3	2	2	2	3	1	2	2
CO 2	1	2	3	3	2	1	3	3	2	1	1	2	3	2
CO 3	2	3	3	3	3	1	1	2	3	1	1	3	3	3
CO 4	2	1	2	3	1	3	1	2	3	3	3	2	1	1
CO 5	1	1	2	3	3	3	2	2	3	2	3	3	1	2
Avg.	1.8	2	2.6	2.6	2	2	2	2.2	2.6	1.8	2.2	2.2	2	2

CE3544	Title: **Advanced Structure Analysis Lab**	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives		

List of Experiments

1. Analysis of continuous beam
2. Analysis of single storey frame
3. Analysis of multi-storey frame
4. Design of multi-storey frame
5. Analysis of multi-storeyed building
6. Design of multi-storeyed building
7. Wind load analysis on rcc building
8. Analysis and design of steel truss
9. Analysis and design of isolated footing
10. Analysis and design of raft footing

Recommendation by Board of Studies on	28-05-2022
Date of approval by the Academic Council	20/10/2022

Course Outcome for CE3544

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to analysis beams BY MAXWELL theorem	3	Em
CO2	Students should be able to analysis column	3	Em
CO3	Students should be able to analysis truss	3	Em
CO4	Students should be able to analysis of arch	2	Em
CO5	student will able to analyses the elastic deformation of curved beam	2	Em

CO-PO Mapping for CE3544

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	1	2	1	1	1	3	3	2	2	2	2	2	3	1
CO 2	2	1	3	2	2	2	1	1	1	3	2	1	2	3
CO 3	3	1	1	3	1	3	2	3	3	1	3	1	1	2
CO 4	1	1	1	1	1	1	2	2	1	3	3	3	3	3
CO 5	3	3	1	2	1	2	1	1	2	3	3	2	1	1
Avg.	2	1.6	1.4	1.8	1.2	2.2	1.8	1.8	1.8	2.4	2.6	1.8	2	2

VP3501	Title: Reasoning Ability	L T P C 2 0 0 2
Version No.	2.0	
Course Prerequisites	Nil	
Objectives	To provide an understanding of the basic reasoning and underlying concepts of mathematical reasoning.	
Expected Outcome	The students will learn and prepare themselves for various competitive exams.	
Unit No.	Unit Title	No. of hrs (per Unit)
Unit I-		05
Number Series, Letter Series, Analogies, Logical Sequence of Words, Direction Sense Test, Coding and Decoding		
Unit II-		07
Rule Detection, Blood Relation, Paper Folding, Mirror Images, Water Images, Cube , Dice, Order & Ranking		
Unit III-		05
Inequality , Syllogism , Sitting Arrangement Circle , Square , Line , Dictionary Order , Word Formation		
Unit IV-		05
Clock , Calendar , Counting of Triangle , Counting of Square , Counting of rectangle , Counting of Line		
Unit V-		06
Logical Venn Diagram,Statement and Course of Action,Statement and Assumption, Statement And Argument , Statement And Conclusion		
Suggesting Readings:	1. R.S. Aggarwal, "Objective Arithmetic." S. Chand & Company New Delhi. 2. R.S. Aggarwal, "Verbal and Non-Verbal Reasoning." S.Chand& Company New Delhi 3. R.S. Aggarwal, "Quantitative Aptitude." S. Chand & Company New Delhi 4. R.D. Sharma, "Senior Secondary Mathematics" Vol: 1 and Vol: 2 New Delhi	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by the Academic Council	20/10/2022	

Course Outcome for VP3501

Course code	**VP3501**
Paper Title	**Reasoning Ability**
CO-1	This program lead to improve advance numerical skills of the students to do calculative part in short period of time.
CO-2	Understanding of advance question of directions, blood relations, ranking, coding-decoding, calendar, and clock enhance the analyzing power of students.
CO-3	Understanding how a person efficiency impact on TIME AND WORK, And let to know the power of compounding in COMPUND INTEREST, also Know about the percentage calculation in various aspects.
CO-4	Calculate advance problem of Time Speed and Distance in various aspects,, how Selling price and Cost price lead to profit or lose.
CO-5	With the help of this student can qualify for various competitive exams (BANK, SSC, POLICE, DEFENCE, ETC.) This will be helpful for written exam of various companies.

SEMESTER- 6

CE3609	Title: **Advanced Design of Concrete Structures**	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	CE3508	
Objectives	The subject aims to develop an understanding of design and detailing of structures	
Unit No.	Unit Title	No. of hours (per Unit)
Unit: 1	**Frames & Continuous Beams**	8
Analysis of Portal Frame & Design. Analysis of multi-stored frame for horizontal & vertical loading using cantilever & portal frame method. Introduction to Continuous Beams - Design examples. Introduction to curved beams - Analysis of bending and torsional moments in a circular beam, Moments in semicircular beams supported on three columns, Design examples.		
Unit II	**Water Tanks**	8
Introduction, general design requirements on no crack basis, Design of circular and rectangular tanks resting on ground, Design philosophy for design of overhead tanks, intze type tanks and their staging and foundation		
Unit III	**Foundation**	8
Different types, design of rectangular, trapezoidal, strap and raft footings, Pile Foundations		
Unit IV	**Retaining Walls**	8
Types, behavior, stability requirements, design of cantilever type retaining walls. Introduction to design of counterfort retaining wall.		
Unit V	**Prestressed Concrete Structures**	8
Introduction to Prestressed Concrete, Pre tensioning and post tensioning, system of prestress. Loses in prestress, Basic assumption, Analysis of beam in flexure		
Text Books	1. Varghese, P.C., "Limit State Design of Reinforced Concrete", Prentice Hall of India, Pvt.Ltd.,NewDelhi 2. Krishna Raju, N., "Design of Reinforced Concrete Structures", CBS Publishers &Distributors, NewDelhi, 2003.	
Reference Books	1. Jain, A.K., "Limit State Design of RC Structures", Nemchand Publications, Rourkee 2. . Sinha, S.N., "Reinforced Concrete Design", Tata McGraw-Hill Publishing Company Ltd., New Delhi. 3. UnnikrishnaPillai, S., DevdasMenon, "Reinforced Concrete Design", Tata McGraw-Hill Publishing Company Ltd., New Delhi	
Mode of Evaluation	Internal and External Examination	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by the Academic Council	20/10/2022	

Course Outcome for CE3609

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to design the portal frame	3	S
CO2	Students should be able to design the continuous beam	3	S
CO3	Students should be able to design the different types of water tank	3	S
CO4	Students should be able to design the combined footing and its type	3	S
CO5	Students should be able to design the retaining wall and its types	3	S

CO-PO Mapping for CE3609

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	1	2	2	2	2	1	2	2	2	1	1	2	1	3
CO 2	3	3	3	1	3	2	2	1	2	1	3	1	2	1
CO 3	2	3	3	2	2	1	2	3	1	2	3	3	1	2
CO 4	3	2	3	1	3	3	1	2	3	3	2	1	3	2
CO 5	3	1	1	3	1	1	2	2	3	3	2	2	2	2
Avg.	2.4	2.2	2.4	1.8	2.2	1.6	1.8	2	2.2	2	2.2	1.8	1.8	2

CE3610	Title: **Water Resource Engineering**	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	CE3308	
Objectives		
Unit No.	Unit Title	No. of hours (per Unit)
Unit: 1	**HYDROLOGY**	6
Introduction and importance of hydrology Hydrologic cycle, Precipitation, forms of precipitation, types of precipitation, Rainfall in India, Measurement of rainfall, types of rain gauges Definition of Hydrograph. Definitions of Abstractions from precipitation Run-off and Estimation of runoff (Runoff co-efficient & Empirical formula methods-only theory), Factors affecting run-off		
Unit II	**METHODSOFIRRIGATION**	6
Methods of irrigation, Subsurface irrigation, Surface irrigation (Border strip method, Furrow method, Basin method), Sprinkler irrigation, Drip irrigation, Quality of water for Irrigation, water requirements of crops, Base period, duty, delta and their relationship Definitions of Gross command area ,cultivable command area , intensity of irrigation, Annual irrigation intensity, Net and gross Sown area, Net & gross irrigated area, Time factor,		
Unit III	**RESERVOIRS AND DAMS:**	6
Introduction, site selection for reservoirs and dams, Earthen dams, Typical cross section of different types of earthen dam, causes of failures of earthen dams Gravity dams, Elementary profile of a gravity dam, list various forces acting on gravity dam, modes of failure of gravity dams, Inspection galleries. Spillways and its types (Reservoir sedimentation).		
Unit IV	**Canals**	6
Canal and its classification (based on alignment, function), Layout of canal system, Canal lining and Maintenance of canals. Types of cross drainage works, Aqueduct, Canal siphon, Super passage, Level crossing, Inlet and outlet. Definition, Location, layout and components of diversion head works, Sketches and description of Weirs, barrage, Body wall of a weir, divide wall Approach channel, canal head regulator, and Fish ladder Difference between weir and barrage.		
Unit V	**GROUND WATER ENGINEERING:**	6
Ground water and its importance, Aquifer, Aquiclude, Aquitard, Aquifuge Aquifer properties -porosity, ground water yield, specific yield, specific retention, permeability, transmissibility. Artificial recharge of ground water and its methods, Ground water pollution protection of wells, Legislation provisions for ground water protection.		
Text Books		
Reference Books		
Mode of Evaluation	Internal and External Examination	
Recommendation by Board of Studies on	28-05-2022	
Date of	20/10/2022	

approval by the Academic Council	

Course Outcome for CE3610

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to understand the basic concept of hydrology.	2	S
CO2	Students should be able to understand the concept of methods of irrigation.	2	S
CO3	Students should be able to understand the concept of reservoirs & dams.	2	S
CO4	Students should be able to understand the concept of canals, their importance.	2	S
CO5	Students should be able to understand the concept of ground water engineering.	2	S

CO-PO Mapping for CE3610

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	1	2	2	3	3	1	3	2	3	2	3	1	2	2
CO 2	3	1	1	2	1	2	1	2	2	1	3	1	1	3
CO 3	1	3	2	2	3	1	3	3	3	1	3	1	2	2
CO 4	2	2	3	1	1	1	2	3	1	1	1	3	2	3
CO 5	3	2	3	3	3	1	3	1	3	3	1	2	3	1
Avg.	2	2	2.2	2.2	2.2	1.2	2.4	2.2	2.4	1.6	2.2	1.6	2	2.2

CE3612	Title: **Geotechnical Engineering**	L T P C 3 2 0 4
Version No.	1.0	
Course Prerequisites	CE3408	
Objectives	Describe the various methods for soil exploration encountered in civil engineering and give an overall preview of various types of foundations.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit: 1	**Soil Exploration**	6
Methods of soil exploration; boring, sampling, penetration tests, correlations between penetration resistance and soil design parameters.		
Unit II	**Earth Pressure and Retaining Walls**	6
Earth pressure at rest, active and passive earth pressure, Rankine and Coulomb's earth pressure theories, earth pressure due to surcharge, retaining walls, stability analysis of retaining walls, proportioning and design of retaining walls.		
Unit III	**Foundations**	6
Types of foundations, , shallow foundations, Terzaghi's bearing capacity theory, computation of bearing capacity in soils, effect of various factors, use of field test data in design of shallow foundations, stresses below the foundations, settlement of footings and rafts, proportioning of footings and rafts, sheeting and bracing of foundation excavation. Types and method of construction, estimation of pile capacity, capacity and settlement of group of piles, proportioning of piles.		
Unit IV	**Well & Machine Foundations**	6
Methods of construction, tilt and shift, remedial measures, bearing capacity, settlement and lateral stability of well foundation. Types of machine foundations, mathematical models, response of foundation – soil system to machine excitation, cyclic plate load test, block resonance test, criteria for design.		
Unit V	**Subsurface Investigation**	6
Objectives of exploration, planning of exploration program, soil samples and soil samplers, field penetration tests: SPT, SCPT, and DCPTIntroduction to geophysical methods, Bore log and report writing.		
Text Books	1. Ranjan, G. and Rao, A.S.R., "Basic and Applied Soil Mechanics", New Age International Publishers. 2. Dr. B.C. Punmia, Er. Ashok K.Jain and Dr. Arun K. Jain " Soil Mechanics And Foundation Engineering:	
Reference Books	1. Holtz, R.D. and Kovacs, W.D., "An Introduction to Geotechnical Engineering", Prentice Hall. 2. Lambe, T.W. and Whitman, R.V., "Soil Mechanics", John Wiley and Sons. 3. Murthy, V.N.S., "Text Book of Soil Mechanics and Foundation Engineering", CBSPublishers.	
Mode of Evaluation	Internal and External Examination	
Recommendation by Board of Studies on	28-05-2022	
Date of	20/10/2022	

approval by the Academic Council	

Course Outcome for CE3612

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to understand the concept of soil exploration	1	S
CO2	Students should be able to analyze the earth pressure for retaining wall	3	S
CO3	Students should be able to understand the types of foundation	2	S
CO4	Students should be able to analyze the bearing capacity of foundation	3	S
CO5	Students should be able to understand the concept of well and machine foundation	2	S

CO-PO Mapping for CE3612

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	1	2	1	2	1	1	3	1	1	2	3	1	3	3
CO 2	3	2	3	1	1	3	3	3	1	2	2	1	1	2
CO 3	2	1	3	2	1	3	3	2	1	1	2	1	1	2
CO 4	3	3	1	3	3	2	1	2	2	3	3	2	3	1
CO 5	2	1	1	3	1	2	3	3	3	3	1	2	1	2
Avg.	2.2	1.8	1.8	2.2	1.4	2.2	2.6	2.2	1.6	2.2	2.2	1.4	1.8	2

CE-3641	Title: **Geotechnical Engineering Lab**	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To impart basic knowledge on properties of soil and strength characteristics as well which are used for foundation designing.	

List of Experiments

1. To Find Particle Size Distribution of coarse grained soil using Sieve Analysis.
2. Determination of water content- dry density relation using light Proctor Compaction Test
3. Determination of In Situ dry density of soil using Sand Replacement Method.
4. Determination of In Situ dry density of soils using Core Cutter Method
5. To Perform Permeability Test.
6. To Perform Relative Density Test.
7. To Perform Unconfined Compression Test.
8. Determination of the Shear Strength Parameters of soil using Triaxial Test.
9. Extraction of Disturbed and Undisturbed Samples
10. To study about Standard Penetration Test.

Recommendation by Board of Studies on	28-05-2022
Date of approval by the Academic Council	20/10/2022

Course Outcome for CE3641

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to determine the different properties of soil using various tests	2	Em
CO2	Students should be able to explore the different types of soil	2	Em
CO3	Students should able to evaluate the water content- dry density relation using light Proctor Compaction Test	3	Em
CO4	Students should able to Perform Permeability Test	2	Em
CO5	Students should able to determine In Situ dry density of soils using Core Cutter Method and Sand Replacement Method.	2	Em

CO-PO Mapping for CE3641

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	1	2	1	3	3	2	3	2	3	1	2	1	1	3
CO 2	1	3	1	2	1	3	3	1	2	1	2	2	1	2
CO 3	3	2	3	1	1	2	3	1	2	2	2	1	2	3
CO 4	1	2	1	3	3	1	3	1	1	3	2	3	3	2
CO 5	1	2	2	2	2	2	2	2	3	2	1	2	1	1
Avg.	1.4	2.2	1.6	2.2	2	2	2.8	1.4	2.2	1.8	1.8	1.8	1.6	2.2

CE3643	Title: **Technical VAP I**	L T P C 2 0 0 2
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	The course aims brush-up the topics important in terms of placement activity.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit: 1	**Building Materials and Construction**	6
.Introduction to Bricks, Stone, Steel, Timber. Tiles, Construction elements of Commercial and Residential Buildings		
Unit II	**Concrete**	6
Introduction to Cement and Aggregates. Mix design of M25, M35, M45		
Unit III	**Structure Analysis**	6
Bending Moment and Shear force, Deflection,		
Unit IV	**RCC and Steel Structures**	3
Limit State Method, Working Stress Method, design of column beam and slab		
Unit V	**Truss and Frames**	3
Analysis of truss and portal frame		
Mode of Evaluation	Internal and External Examination	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by the Academic Council	20/10/2022	

Course Outcome for CE3643

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Student will be able to apply the engineering knowledge to attain the problem-solving skills required during the placement drives.	2	Em
CO2	Student will be able to develop ability to face technical interviews.	2	Em
CO3	Student will be able to know the types of technical questions asked by the companies in the placement drives.	2	Em
CO4	Students should be able to solve complex civil engineering problems.	3	Em
CO5	Students should be able to give answers of technical questions.	3	Em

CO-PO Mapping for CE3643

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	1	3	2	2	1	1	1	1	1	2	3	3	1	2
CO 2	2	3	3	1	1	1	2	1	1	3	2	2	2	1
CO 3	3	1	3	2	3	1	3	3	1	2	2	2	2	1
CO 4	1	2	2	2	1	3	2	1	3	1	1	1	2	1
CO 5	2	1	1	3	1	3	3	3	1	3	3	3	2	2
Avg.	1.8	2	2.2	2	1.4	1.8	2.2	1.8	1.4	2.2	2.2	2.2	1.8	1.4

CE3644	Title: **Water Resource Engineering Lab**	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives		

List of Experiments

1. Measurement of Rainfall by non –recording rain gauge.
2. Measurement of rainfall by recording rain gauge.
3. To determine mean rainfall of an area by Thiessen mean Polygon method.
4. To determine mean rainfall of an area by isohyetal method.
5. The determine meanings rogosity coefficient.
6. To determine the velocity of a running of a stream in a canal by current meter and calculate the approximate discharge of the canal.
7. To design a regime channel by Lacey's theory for a given .pattern of crops and area to be irrigated.
8. To determine the yield of an open well by recuperation test.
9. To determine the yield of an open well by constant level pumping test.
10. To visit a Multipurpose River valley, project and to prepare a report of the solid project.

Recommendation by Board of Studies on	28-05-2022
Date of approval by the Academic Council	20/10/2022

Course Outcome for CE3644

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to understand Measurement of Rainfall by recording & non –recording rain gauge.	2	S
CO2	Students should be able to determine mean rainfall of an area by Thiessen mean Polygon method, isohyetal method.	3	Em
CO3	Students should be able to determine meanings rogosity coefficient & velocity of a running of a stream in a canal by current meter and calculate the approximate discharge of the canal.	3	Em
CO4	Students should be able to design a regime channel by Lacey's theory for a given .pattern of crops and area to be irrigated.	3	Em
CO5	Students should be able To determine the yield of an open well by constant level pumping test.	2	Em

CO-PO Mapping for CE3644

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	2	1	1	3	1	3	1	2	1	1	3	2	1
CO 2	2	3	1	3	1	2	2	1	3	1	2	2	3	3
CO 3	2	1	3	3	2	2	2	2	3	1	1	3	3	2
CO 4	2	1	2	3	1	2	2	3	1	3	3	2	1	1
CO 5	2	2	3	1	1	1	3	3	2	1	1	1	3	2
Avg.	2.2	1.8	2	2.2	1.6	1.6	2.4	2	2.2	1.4	1.6	2.2	2.4	1.8

CE3608	Title: **Geomatics Engineering**	L T P C **30 0 3**
Version No.	1.0	
Course Prerequisites	**Nil**	
Objectives	To provide information of remote sensing and its applications, explanation about the basic concepts of GIS& GPS.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	**Fundamentals of GPS**	6
Components of GPS, GPS receivers, Reference coordinates systems – datums, geoid, ellipsoid, WGS 84 system, time, signal propagation through atmosphere-their modeling and estimation, satellite orbit.		
Unit II	**GPS Signals and GPS Data**	6
Navigational data.Collection methods – Static positioning, Kinematic positioning –pseudo-kinematic and stop & go, Observation planning and strategy.		
Unit: III	**Utility of GIS**	6
Introduction, Geographical concepts and terminology, Difference between image processing system and GIS. Utility of GIS, various GIS packages and their salient features, Essential components of a GIS.		
Unit IV	**Data acquisition**	6
Data acquisition through scanners and digitizers, methods of digitization. Raster and vector data, Data storage, Verification and editing.		
Unit V	**Applications of GPS & GIS**	6
Data manipulation and analysis, Spatial and mathematical operations on data, area analysis, Query-based analysis. Applications of GPS & GIS for various Natural resources mapping &monitoring and for engineering applications.		
Text Books	1. Burrough, P.A. and McDonnell, R.A., "Principles of Geographic Information for Land Resources Assessment", Oxford University Press. 2. Demers, M.N., "Fundamentals of Geographic Information System", 3rd Ed.,John Wiley.	
Reference Books	1. Legg, C.A., "Remote Sensing and Geographic Information System", JohnWiley. 2. Chandra, A.M. and Ghosh, S.K., "Remote Sensing and GeographicalInformation Systems", Alpha Science. 3. Maguire, D.J., Batty, M. and Goodchild, M. (Eds.). "GIS, Spatial Analysis and Modelling", ESRI Press.	
Mode of Evaluation	Internal and External Examination	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by the Academic Council	20/10/2022	

Course Outcome for CE3608

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to understand fundamentals of GPS.	2	S
CO2	Students should be able to understand types of GPS signals and its data.	2	S
CO3	Students should be able to understand utility of GIS.	2	S
CO4	Students should be able to understand data acquisition.	2	S
CO5	Students should be able to understand applications of GPS & GIS.	2	S

CO-PO Mapping for CE3608

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	1	1	1	3	2	1	2	3	3	1	3	1	2
CO 2	2	3	3	3	1	1	3	3	1	3	1	3	2	3
CO 3	1	3	1	2	1	1	3	3	1	2	3	2	1	2
CO 4	1	1	1	1	2	1	1	1	3	1	3	3	1	2
CO 5	2	2	3	2	3	2	3	3	2	2	1	1	1	1
Avg.	1.8	2	1.8	1.8	2	1.4	2.2	2.4	2	2.2	1.8	2.4	1.2	2

CE3609	Title:Building Construction Practice	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To make the students aware of precautionary measures to be taken during construction to avoid any damage to the structure at a later date.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Properties & Testing of Materials	4
Physical and Mechanical properties of construction materials – stones, brick, cement, aggregate, timber, tiles. Testing of said materials as per BIS specifications.		
Unit II	Properties of Miscellaneous Materials	6
Structural Steel and Aluminium, Roofing Material, Physical descriptions of asbestos sheets, GI sheets, tubes and light weight roofing materials, Timber and its Products, Modern materials, Neoprene, thermocol, vinyl flooring, decorative panels and laminates, anodisedaluminium, architectural glass and ceramics, Ferro cement, PVC, polymer base materials and Fibre Reinforced Polymer (FRP).		
Unit III	Brick & Stone Masonry	6
Brick masonry construction- Principles of construction, types of bonds, introduction to reinforced brick work, lintels and arches.Stone masonry – Types of stone masonry & method of its construction, lintels and arches. Finishing- Pointing, Plastering, Paintings, varnishing.General Principles of – Flooring and its types, Roofing and its types, Damp proof course (DPC).		
Unit IV	Foundations	4
Function of foundation, Types of foundation- Shallow and deep, there methods of construction.		
Unit V	Thermal Insulation and Acoustic	4
Thermal insulation- Types of materials, Heat transfer and basic definition, methods of thermal insulations for roof, exposed walls, doors and windows in building construction. Acoustics- Types of materials for improvement of acoustics in building construction, audible sound, behaviour of sound, reflection of sound, reverberation and absorption, sound insulation and acoustic design of hall.		
Text Books	1. Rangwala, Engineering Materials, Charotar Publishing House Pvt. Ltd. 2. Ashok Kumar Jain, Dr. B.C. Punmia, Arun Kumar Jain, Building Construction, Laxmi Publications Pvt. Ltd. 3. M.L.Gambhir, Concrete Technology, Tata McGraw Hill Education.	
Reference Books	1. P.C.Varghese, Engineering Materials, 1st edition, PHI Learning. 2. S.K.Duggal, Building Materials, 3rd Edition, New Age International Publishers	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by the Academic Council	20/10/2022	

Course Outcome for CE3609

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to understand the Properties & Testing of Materials	2	S
CO2	Students should be able to understand the Properties of Miscellaneous Materials	2	S
CO3	Students should able to understand the properties of Brick & Stone Masonry	2	S
CO4	Students should able to understand the concept of Foundations	2	S
CO5	Students should be able to understand the Thermal Insulation and Acoustic	2	S

CO-PO Mapping for CE3609

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	1	3	3	3	2	3	3	3	1	2	1	1	1
CO 2	3	1	2	1	3	2	2	3	3	3	1	1	1	1
CO 3	2	3	1	3	3	3	2	3	2	2	3	1	3	3
CO 4	1	3	3	1	1	2	3	3	2	1	3	1	3	3
CO 5	1	1	3	1	2	1	3	1	3	2	3	2	2	3
Avg.	2	1.8	2.4	1.8	2.4	2	2.6	2.6	2.6	1.8	2.4	1.2	2	2.2

CE3610	Title:Construction Project Planning & Systems	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	Construction project planning and administration the art of directing and coordinating human and material resources throughout the life of a project by using modern management techniques to achieve predetermined objectives of scope, cost, time, quality and participation satisfaction.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit: I	Project Management	8
Introduction, Project planning, scheduling, controlling, Role of decision in project management, Project management Process and role of Project Manager.		
Unit II	Project Planning Tools	7
Bar Charts and Milestones Chart: Introduction, Development of bar chart, Short comings and remedial measures, Milestone charts. CPM & PERT: Elements of network, Time estimates, frequency distribution, mean, variance and standard deviation, probability distribution.		
Unit III	Cost Analysis & Updating	7
Introduction, Projects cost: Direct cost, Indirect cost, slope of direct cost curve, total project cost and optimum duration, cost optimization.		
Unit IV	Risk analysis and Resource allocation	7
Certainty, risk and uncertainty, risk management, identification and nature of construction risks, contractual allocation of risk, types of risks, minimizing risks and mitigating losses, use of expected values, utility in investment decisions, decision trees, sensitivity analysis.		
Unit V	Construction Equipment	7
Types of compaction Equipment's, Types of Excavation and digging Equipment's, Types of hoisting equipment's, Types of Material handling Equipment's and Types of heavy earth moving equipment's.		
Text Books	1. Project Planning and Control with PERT and CPM by B. C. Punmia, K.K. Khandelwal, Laxmi Publication. 2. Sharma S.C. Construction equipment and management, Khanna Publishers,New Delhi.	
Reference Books	1. Peurifoy,R.L., Ledbetter.W.B and schexnayder,C, construction planning and equipment methods, McGraw Hill, Singapore. 2. Callahan,M.T., Quackenbush,D.G.,androwing,J.E., Construction project scheduling, McGraw Hill ,New York. 3. Cleland, D.I. and Ireland, L.R., project management: Strategic design and implementation,, McGraw-Hill, New York.	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by the Academic	20/10/2022	

Council	

Course Outcome for CE3610

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to understand basics of Project Management	2	S
CO2	Students should be able to understand Project Planning Tools	2	S
CO3	Students should be able to understand the. Cost Analysis & Updating	2	S
CO4	Students should be able to understand the Risk analysis and Resource allocation	2	S
CO5	Students should be able to understand the Construction Equipment	2	S

CO-PO Mapping for CE3610

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	1	2	3	1	2	3	2	2	1	2	3	1	3
CO 2	1	2	3	1	3	1	3	1	3	1	2	3	1	2
CO 3	1	2	2	2	2	2	2	3	3	2	1	2	2	3
CO 4	3	3	1	1	2	3	3	1	2	2	1	2	1	3
CO 5	3	1	1	2	2	1	1	3	2	1	3	3	3	3
Avg.	2	1.8	1.8	1.8	2	1.8	2.4	2	2.4	1.4	1.8	2.6	1.6	2.8

CE3611	Title: Construction Cost Analysis	L T P C 3 1 0 4
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To make the students aware of those factors that affect the cost of construction work and to analyze the influences that effect change in these factors.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit: I	Estimate	8
Principle of estimation, units, item work, different kinds of estimates, different methods of estimation, estimation of materials in single room building, two room building, multi-story buildings, with different sections of walls ,foundation, floors and roofs, R.B and R.C.C works, Plastering, white washing, Distempering and painting, doors and windows, lump sum items, Estimates of canals, dams, barrages, Hilly roads etc.		
Unit II	Specification of Works	7
Necessity of specification types of specification, general specification, specification of bricks, cement, sand, water, lime, reinforcement, detailed specification for earthwork, cement, concrete, brickwork, flooring, D.P.C, R.C.C, cement plastering, white and colour washing, distempering, painting.		
Unit III	Rate analysis	7
Purpose, importance and requirements of rate analysis, units of measurement preparation of rate analysis. Procedure of rate analysis for items: Earth work, concrete works, R.C.C works, reinforce brick work ,plastering ,painting ,finishing (white washing ,distempering)		
Unit IV	Public Works Account	7
Tender and acceptance of tender, Earnest money, security money, retention money, measurement book, cash book, preparation, examination and payment of bills, first and final bills, administrative sanction, technical sanction.		
Unit V	Valuation	7
Purpose of valuation, principles of valuation depreciation, sinking fund, salvage & scrap value, valuation of a building: cost method, rental –return method.		
Text Books	3. Dutta BN, Estimating & costing.	
Reference Books	4. Rangwala SC Estimating &Costing, AnandCharotar Book Stall.	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by the Academic Council	20/10/2022	

Course Outcome for CE3611

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to understand fundamentals of estimation.	2	S
CO2	Students should be able to understand the concept of Specification of Works	2	S
CO3	Students should be able to understand the Rate analysis	2	S
CO4	Students should be able to understand the concept of Public Works Account	2	S
CO5	Students should be able to understand applications of Valuation	2	S

CO-PO Mapping for CE3611

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	1	1	1	3	2	1	2	3	3	1	3	1	2
CO 2	2	3	3	3	1	1	3	3	1	3	1	3	2	3
CO 3	1	3	1	2	1	1	3	3	1	2	3	2	1	2
CO 4	1	1	1	1	2	1	1	1	3	1	3	3	1	2
CO 5	2	2	3	2	3	2	3	3	2	2	1	1	1	1
Avg.	1.8	2	1.8	1.8	2	1.4	2.2	2.4	2	2.2	1.8	2.4	1.2	2

VP3601	Course Title: GD/PI	L T P C 20 0 2
Unit No.	SESSION CONTENT	No. of hours (per Unit)
UNIT 1	CV Preparation Chronological order in a CV. Do's & Don'ts in a CV	4
UNIT 2	Presentation Skills Newspaper Reading/ News Narration/ PPT Presentation Article Writing	4
UNIT 3	Public Speaking Extempore Debate	4
UNIT 4	Group Discussion Discussions on Social/ Political/ Current affairs/ Economical topics	4
UNIT 5	Professional Grooming & Mock Interviews Tips on Professional attire for a Group Discussion & Interview Test of student's presentation skills, speaking skills, confidence, knowledge	4
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by the Academic Council	20/10/2022	

SEMESTER 7

CE3701	Title: Health Safety & Environment Management	L T P C 4 0 0 4
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To impart basic understanding of Health & Safety	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Health Hazard	6
Toxicity, physiological, asphyxiation, respiration and skin effects. Effects of sour gases (H2 S and CO) on human health. Effect of corrosive material and atmosphere during sand control, fracturing and acidization operation.		
Unit II	Safety Analysis	6
Operational risk in Industry, production and handling of oil and Gas, fireHazard: safety in drilling. Manual. Gas leakage, fire detection and suppression systems. Hazard and failure mode analysis: disaster and crisis management.		
Unit III	Environment Health and Safety	6
Impact of oil and gas on air, water and soil pollution, impact of drilling and production operations, offshore problems, oil-spill control. Environmental impact assessment. Waste treatment & Management methods, effluent water treatment and disposal. Contaminated soil remediation.		
Unit IV	Noise pollution	6
Noise pollution and remediation measure. Industrial Accident & prevention: Safety sampling, Accident and Safety Audit; Legal requirements, Disaster Planning and control. Safety in offshore operations.		
Unit V	Detector	6
Gas detection fire detection and suppression, personal protection measures. Occupational Physiology: Respiratory and skin effect. HSE regulation; oil mines regulations.		
Text Books	1. Health Safety & Environment by Parker & Sons, BPB Publications 2. Health Safety & Environment by K.T.Narayanan	
Reference Books	1. Safety & Regulations 2015 , 2nd Ed., Academic Press 2. Safety in oil and Gas Fields of India, Indian Petroleum Publications 3. Guide to Environment Safety & Health Management, Frances Alston, Emily J Miliki 4. Health Safety & Environment, ChetanPrakashan	
Mode of Evaluation	Internal and External Examination	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by the Academic Council	20/10/2022	

Course Outcome for CE3701

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to understand respiration and skin effects.	2	Em
CO2	Students should be able to understand safety analysis during drilling.	2	S
CO3	Students should be able to evaluate management & impact of oil and gas.	2	S
CO4	Students should be able to determine remediation measure & prevention.	2	En
CO5	Students should be able to understand HSE regulation.	1	None

CO-PO Mapping for CE3701

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	1	1	2	3	1	3	1	3	3	3	3	1	1
CO 2	2	1	1	2	2	2	2	3	3	2	1	3	1	1
CO 3	1	2	1	3	2	3	3	1	2	2	3	3	3	3
CO 4	1	3	1	2	3	3	3	1	1	1	2	3	1	2
CO 5	2	1	3	3	1	2	1	3	2	2	3	1	3	1
Avg.	1.6	1.6	1.4	2.4	2.2	2.2	2.4	1.8	2.2	2	2.4	2.6	1.8	1.6

CE3702	Title: Estimation and Costing	L T P C 4 0 0 4
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	To know the importance of preparing the types of estimates under different conditions and to know about the rate analysis and bill preparations	
Unit No.	Unit Title	No. of hours (Per Unit)
Unit I	Introduction	6
Types of estimates - Units of measurements; Methods of estimates – Advantages of estimates of Buildings; Calculations of quantities of brick work, RCC, PCC, Plastering, white washing, color washing and paintings / varnishing for shops, rooms, residential building with flat roof.		
Unit II	Estimates of other Structures	6
Estimates of Septic tank, Soak pit, Sanitary and water supply installations (water supply pipe line, sewer line); Estimate of bituminous and cement concrete roads; Estimate of retaining walls, culverts; Estimating of irrigation works - aqueduct, siphon, fall.		
Unit III	Specifications and Tenders	6
P.W.D. Schedule and cost indices for building material and labor. Schedule of rates; Analysis of rates; Specifications – Sources, Detailed and general specifications; Tenders; Contracts - Types of contracts, Contract Documents.		
Unit IV	Valuation	3
Necessity - Basics of value engineering; Capitalized value; Depreciation; Escalation value of Building; Calculations of Standard rent - Mortgage, Lease.		
Unit V	Report Preparation	3
Principles for report preparation - report on estimate of residential building, Culvert, Roads; Water supply and sanitary installations - Tube wells, Open wells.		
Text Books	1. Kohli D D and Kohli R C., "A Text Book of Estimating and Costing (Civil)", S. Chand & Company Ltd.	
Reference Books	1. Rangwala, S.C, Estimating and Costing", Anand, CharotarBookStall 2. Chakraborti, M, "Estimating, Costing and Specification in Civil Engineering",Calcutta 3. Dutta, BN, "Estimating andCosting 4. Mahajan Sanjay, "Estimating and Costing" SatyaParkashan,Delhi	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by the Academic Council	20/10/2022	

Course Outcome for CE3702

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Student should be able to understand the importance of estimation and costing.	2	Em
CO2	Student should be able to analyze the estimates of different structures.	2	S
CO3	Student should be able to understand about the Tenders.	2	S
CO4	Student should be able to analyze the concept of Valuation.	2	En
CO5	Student should be able to understand the concept of Report Preparation	1	None

CO-PO Mapping for CE3702

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	3	2	3	1	1	1	1	1	1	2	1	1	1
CO 2	3	2	3	1	3	1	2	2	1	2	3	2	1	3
CO 3	1	1	2	2	2	3	3	3	3	3	1	2	2	1
CO 4	1	3	2	3	3	3	1	2	3	3	1	1	2	2
CO 5	3	3	3	2	1	3	3	3	1	2	2	2	1	1
Avg.	2.2	2.4	2.4	2.2	2	2.2	2	2.2	1.8	2.2	1.8	1.6	1.4	1.6

CE3741	Title: Estimation lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To know the importance of preparing the types of estimates under different conditions and to know about the rate analysis and bill preparations	
Expected Outcome	• Students should be able to estimate the quantity of structures • Students should be able to evaluate the quantity • Students should be able to present reports	

List of Experiments

1. Estimate the quantity Cement Sand & Aggregate of 2 BHK flat of a given drawing
2. Estimate the quantity Bricks and floors of 2 BHK flat of a given drawing
3. Estimate the quantity R.C.C of 2 BHK flat of a given drawing
4. Estimate the quantity of building material of a water tank flat of a given drawing
5. Prepare PPT of a quantity of building material of 2 BHK flat of a given drawing
6. Estimate the quantity of material of proposed MDR of a given drawing
7. Estimate the labor and material cost of proposed building

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	28-05-2022
Date of approval by the Academic Council	20/10/2022

Course Outcome for CE3741

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to estimate the quantity of structures	2	Em
CO2	Students should be able to evaluate the quantity	2	S
CO3	Students should be able to present reports	2	S
CO4	Students should be able to estimate the material quantity	2	En
CO5	Students should be able to done price analysis	1	None

CO-PO Mapping for CE3741

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	3	2	2	3	3	1	1	1	1	3	3	1	1
CO 2	2	2	3	1	3	2	1	3	1	2	3	3	2	2
CO 3	3	2	3	3	2	1	2	3	2	3	3	3	1	1
CO 4	2	2	1	1	1	2	2	3	3	1	1	3	2	2
CO 5	3	1	3	2	2	3	2	2	1	2	2	3	2	1
Avg.	2.6	2	2.4	1.8	2.2	2.2	1.6	2.4	1.6	1.8	2.4	3	1.6	1.4

CE3703	Title: Bridge Engineering	L T P C 3 00 3
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	After the successful completion of the course student should be able to able to describe and understand better about the bridge engineering and various components of bridge.	
Unit No.	Unit Title	No. of hours (Per Unit)
Unit: 1	Introduction	8
Types Of Bridges type of bridge: Timber and stone masonry bridges, Iron and steel bridges, RCC bridges a Prestressed concrete Bridges		
Unit II	Bridge Loading Standards	8
Indian Road Congress (Bridge loading standards), Impact factors, Indian Railway Bridge loading standards		
Unit III	Design Of Bridge Culvert, Tee Beam Bridge	8
General Features, Design Loads, Design Moments, Shears and Thrusts, Critical sections and its example		
Unit IV	Bearing and its Classification	8
Types of bearings and their design; Various types of bearings and their design		
Unit V	Foundation For Bridge Structure	8
General Aspects, Types of Foundation, Pile Foundation, Well Foundation and Caisson Foundation.		
Text Books	1. Ponnuswamy, S., Bridge Engineering", Tata McGraw-Hill 2005 2. Rajgopalan, N., "Bridge Super Structures", Narosa Publishing. 2006	
Reference Books	1. Mondorf, P.E., "Concrete Bridges", Taylor & Francis. 2006 2. Ryall, M.J., Parke, G.A.R and Harding. J.E., "The Manual of Bridge Engineering", Thom Telford. 2002	
Mode of Evaluation	Internal and External Examination	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by the Academic Council	20/10/2022	

Course Outcome for3703

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Student should be able to understand the types of bridge and its components.	2	Em
CO2	Student should be able to understand the concept of bridge loading standards.	2	S
CO3	Student should be able to analyze the design of Bridge Culvert, Tee Beam Bridge.	2	S
CO4	Student should be able to understand the concept of bearing and its classification.	2	En
CO5	Student should be able to understand the concept of foundation for Bridge Structure	1	None

CO-PO Mapping for CE3703

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	1	2	1	2	3	1	2	3	2	1	2	3	1	1
CO 2	1	1	3	1	3	2	1	1	1	1	1	1	2	3
CO 3	3	1	3	1	2	2	3	3	1	1	1	3	1	2
CO 4	3	2	1	1	1	3	3	2	2	3	2	3	3	1
CO 5	1	2	2	2	3	2	3	1	2	2	2	2	3	2
Avg.	1.8	1.6	2	1.4	2.4	2	2.4	2	1.6	1.6	1.6	2.4	2	1.8

CE3705	Title: Earthquake Resistant Constructions	L T P C 3 00 3
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To make students familiar about seismic forces and to provide techniques to resist collapses during earthquakes. To provide the knowledge about response spectra, and its implementation	
Unit No.	Unit Title	No. of hours (Per Unit)
Unit I	Introduction	6
Origin of Earthquakes, Magnitude, Intensity, Ground motions, Sensors, Strong motion characteristics.		
Unit II	Response of Structures	6
Response of Structure to Earthquake motion, Base shear calculation, Distribution of base shear Modeling of structures, S.D.O.F. Systems- Equation of motion, Free and Forced vibrations, Damping, Response Spectrum.		
Unit III	System	6
M.D.O.F Systems. - Two degree and multi-degree freedom systems.		
Unit IV	Seismic Analysis and Modeling	3
Seismic Analysis and Modeling of R.C. Buildings- Codal procedure for determination of design lateral loads, In-fill walls, Seismic analysis of R.C. building as per IS: 1893 (Part1)		
Unit V	Earthquake Resistant Design	3
Earthquake Resistant Design of Buildings-Ductility considerations, E.R.D. of R.C. building, Design of load bearing buildings, Design of shear wall.		
Text Books	1. P. Agarwal & M. Shrikhande, "Earthquake Resistant Design of Structures", PHI PrivateLearning, Delhi. 2. Duggal S.K. "Earthquake Resistant Design of Structures", Oxford University Press Delhi	
Reference Books	1. Mario Paz, "Structural Dynamics – Theory & Computation Dynamics of Structures" 2. ChopraAnil K. "Theory and Applications to Earthquake Engineering", Prentice Hall India, Delhi 3. Kramer Steven L. "Geotechnical Earthquake Engineering", Pearson Education.	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by the Academic Council	20/10/2022	

Course Outcome for CE3075

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Student should be able to able to understand the introduction about the Earthquake.	2	Em
CO2	Student should be able to able to understand the concept of Earthquake Response of Structure.	2	S
CO3	Student should be able to able to understand the concept of Two degree and multi-degree freedom systems.	2	S
CO4	Student should be able to able to understand the concept of Seismic Analysis and Modeling.	2	En
CO5	Student should be able to able to analyze the concept of Earthquake Resistant Design	1	None

CO-PO Mapping for CE3705

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	2	3	3	3	2	3	2	3	1	2	2	1	1
CO 2	3	2	2	3	3	2	2	2	1	2	2	1	1	1
CO 3	3	1	1	3	2	3	2	2	2	2	2	1	3	2
CO 4	1	3	2	3	1	3	2	2	3	1	2	2	1	1
CO 5	1	1	3	2	3	1	3	3	3	3	2	3	1	2
Avg.	2	1.8	2.2	2.8	2.4	2.2	2.4	2.2	2.4	1.8	2	1.8	1.4	1.4

CE3709	Title: **Masonry Structures**	L T P C 3 0 0 3
Version No.	**1.0**	
Course Prerequisites	**Nil**	
Objectives	To give knowledge onMasonry Structures	
Unit No.	**Unit Title**	**No. of hours (per Unit)**
Unit: I	**MASONRY UNITS,**	8
Brick, stone and block masonry units – strength, modulus of elasticity and water absorption of masonry materials –classification and properties of mortars, selection of mortars. Defects and errors in masonry construction, cracks in masonry, types, reasons for cracking, methods of avoiding cracks.		
Unit II	**STRENGTH AND STABILITY**	7
Strength and Stability of concentrically loaded masonry walls, effect of unit strength, mortar strength, joint thickness, rate of absorption, and effect of curing, effect of ageing, workmanship, strength formulae and mechanism of failure for masonry subjected to direct compression.		
Unit III	**PERMISSIBLE STRESSES**	7
Permissible compressive stress, stress reduction and shape reduction factors, increase in permissible stresses for eccentric vertical and lateral loads, permissible tensile and shear stresses.		
Unit IV	**DESIGN CONSIDERATIONS**	7
Effective height of walls and columns, opening in walls, effective length, effective thickness, slenderness ratio, eccentricity, load dispersion, arching action, lintels.		
Unit V	**DESIGN OF MASONRY WALLS**	7
Design of load bearing masonry forbuilding up to 3 storeys using IS: 1905 and SP: 20 procedure, Application, flexural and compressionelements, shear walls.		
Text Books	Plain and Reinforced Concrete, Vol. I, Jain &Jaikrishna, Nemchand Brothers.	
Reference Books	Prestressed Concrete, Krishna Raju, Tata McGraw Hill. Ultimate Strength Design for Structural Concrete, Arthur P D &Ramkrishnan V, Wheeler & Co.	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by the Academic Council	20/10/2022	

Course Outcome for CE3709

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Student should be able to understand the concept of masonry units	2	S
CO2	Student should be able to understand the concept of strength and stability	2	S
CO3	Student should be able to understand the concept of permissible stresses	2	S
CO4	Student should be able to understand the DESIGN considerations	2	S
CO5	Student should be able to understand the concept of design of masonry walls	2	S

CO-PO Mapping for CE3709

Course Outcomes	Program Outcomes (Course Articulation Matrix(Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	1	2	1	3	2	1	3	3	3	3	2	2	1
CO 2	2	2	1	1	3	2	3	2	2	2	1	1	1	1
CO 3	2	3	1	2	3	2	2	1	3	3	2	1	1	3
CO 4	2	1	3	1	2	2	1	3	3	2	2	2	3	2
CO 5	2	1	2	2	2	3	1	3	3	2	2	3	2	2
Avg.	2	1.6	1.8	1.4	2.6	2.2	1.6	2.4	2.8	2.4	2	1.8	1.8	1.8

CE3710	Title:Pre-stress Concrete	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	Understand the principles and necessity of prestressed concrete structures.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit: I	Introduction	8
Pre-stressing General Considerations- Principal tension and compression- Improving shear resistance of concrete by horizontal and vertical prestressing and by using inclined or parabolic cables- Analysis of rectangular and I beams for shear – Design of shear reinforcements- IS Code provisions.		
Unit II	Methods and Systems of prestressing	7
Pretensioning and Posttensioning methods and systems of prestressing like Hoyer system, MagnelBlaton system, Freyssinet system and Gifford- Udall System Lee McCall system. Losses of Prestress: Loss of prestress in pretensioned and posttensioned members due to various causes like elastic shortage of concrete, shrinkage of concrete, creep of concrete, relaxation of stress in steel, slip in anchorage, frictional losses.		
Unit III	Flexure	7
Analysis of sections for flexure- beams prestressed with straight, concentric, eccentric, bent and parabolic tendons- stress diagrams- Elastic design of PSC slabs and beams of rectangular and I sections- Kern line – Cable profile and cable layout.		
Unit IV	Composite Beam	7
Different Types- Propped and Unpropped- stress distribution- Differential shrinkage- Analysis of composite beams- General design considerations.		
Unit V	Deflection	7
Importance of control of deflections- Factors influencing deflections – Short term deflections of uncracked beams- prediction of long time deflections- IS code requirements.		
Text Books	Prestressed concrete by S. RamamruthamDhanpatRai and Sons, Delhi.	
Reference Books	1. Prestressed concrete by Krishna Raju, Tata McGraw Hill Book – Co. New Delhi. 2. Design of prestress concrete structures by T.Y. Lin and Burn, John Wiley, New York.	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by the Academic Council	20/10/2022	

Course Outcome for CE3710

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Student should be able to understand the knowledge of Pre-stress Concrete	2	S
CO2	Student should be able to understand the concept of Methods and Systems of pre-stressing	2	S
CO3	Student should be able to analyze the Flexure	3	S
CO4	Student should be able to analyze the Composite Beam	3	S
CO5	Student should be able to analyze the Deflection	3	S

CO-PO Mapping for CE3710

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	3	3	1	1	1	1	3	3	3	2	3	2	3
CO 2	2	3	3	1	2	3	2	3	1	1	2	1	3	3
CO 3	1	2	3	3	3	3	3	2	2	3	1	3	1	2
CO 4	2	3	3	2	2	1	3	3	1	2	3	3	3	2
CO 5	2	2	3	2	2	1	1	1	3	1	1	2	2	2
Avg.	2	2.6	3	1.8	2	1.8	2	2.4	2	2	1.8	2.4	2.2	2.4

CE3711	Title:System Engineering and Economics	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To enable students to understand the fundamental economic concepts applicable to engineering and to learn the techniques of incorporating inflation factor in economic decision making.	
Expected Outcome		
Unit No.		No. of hours (per Unit)
Unit: I	Introduction	8
Introduction to Economics- Flow in an economy, Law of supply and demand, Concept of Engineering Economics – Engineering efficiency, Economic efficiency, Scope of engineering economics – Element of costs, Marginal cost, Marginal Revenue, Sunk cost, Opportunity cost, Break-even analysis – V ratio, Elementary economic Analysis – Material selection for product Design selection for a product, Process planning		
Unit II	Value Engineering	7
Make or buy decision, Value engineering – Function, aims, and Value engineering procedure. Interest formulae and their applications –Time value of money, Single payment compound amount factor, Single payment present worth factor, Equal payment series sinking fund factor, Equal payment series payment Present worth factor- equal payment series capital recovery factor – Uniform gradient series annual equivalent factor, Effective interest rate, Examples in all the methods.		
Unit III	Cash Flow	7
Methods of comparison of alternatives – present worth method (Revenue dominated cash flow diagram), Future worth method (Revenue dominated cash flow diagram, cost dominated cash flow diagram), Annual equivalent method (Revenue dominated cash flow diagram, cost dominated cash flow diagram), rate of return method, Examples in all the methods.		
Unit IV	Cost concept	7
Cost concepts, Elements of costs, Preparation of cost sheet, Segregation of costs into fixed and variable costs. Break-even analysis (Simple numerical problems to be solved) Indian Banking System: Banks: Meaning, nature, characteristic of the Indian banking system, functions of commercial banks, functions of Reserve Bank of India, Overview of Indian Financial System.		
Unit V	Engineering Economics	7
Engineering Economics – Nature and scope, General concepts on micro &macroeconomics. The Theory of demand, Demand function, Law of demand and its exceptions, Elasticity of demand, Law of supply and elasticity of supply.Theory of production, Law of variable proportion, Law of returns to scale.		
Text Books	PanneerSelvam, R, “Engineering Economics”, Prentice Hall of India Ltd, New Delhi, 2001.	
Reference Books	Degarmo, E.P., Sullivan, W.G and Canada, J.R, “Engineering Economy”, Macmillan, New York, 2011. Zahid A khan: Engineering Economy, “Engineering Economy”, Dorling Kindersley, 2012	

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	28-05-2022
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Course Outcome for CE3711

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Student should be able to understand the basic knowledge about the subject.	2	S
CO2	Student should be able to understand the concept of Value Engineering	2	S
CO3	Student should be able to understand the concept of Cash Flow	2	S
CO4	Student should be able to understand the concept of Cost concept	2	S
CO5	Student should be able to understand the Engineering Economics	2	S

CO-PO Mapping for CE3711

Course Outcomes	Program Outcomes (Course Articulation Matrix(Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	3	3	3	1	2	1	2	1	3	2	2	1	3
CO 2	1	1	2	2	3	1	3	1	1	2	2	3	2	1
CO 3	3	1	1	3	2	3	1	1	1	2	1	2	1	3
CO 4	1	3	2	2	3	3	1	2	3	3	2	1	1	2
CO 5	2	2	3	3	3	3	2	3	3	1	3	2	2	3
Avg.	1.8	2	2.2	2.6	2.4	2.4	1.6	1.8	1.8	2.2	2	2	1.4	2.4

CE3706	Title: Hydrology	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To introduce the student the concept of hydrological aspects of water availability and requirements and should be able to quantify, control and regulate the water resources.	
Expected Outcome	• Student should be able to understand the concept of precipitation. • Student should be able to understand the concept of runoff. • Student should be able to understand the concept of flood and drought. • Student should be able to understand the concept of reservoirs. • Student should be able to understand the concept of groundwater and management.	

Unit No.	Unit Title	No. of hours (Per Unit)
Unit: I	Precipitation and Abstractions	08
Hydrological cycle- Meteorological measurements – Requirements, Types and forms of precipitation - Rain Gauges- Spatial analysis of rainfall data using Thiessen and Isohyet methods, Pan evaporation measurements and evaporation suppression - Infiltration-Horton's equation - Double Ring Infiltrometer, Infiltration indices.		
Unit II	Runoff	08
Watershed, catchment and basin - Catchment characteristics - Factors affecting runoff - Run off estimation using empirical – Strange's table and SCS methods – Stage discharge relationships- Flow measurements- Hydrograph – Unit Hydrograph – IUH		
Unit III	Flood and Drought	08
Natural Disasters-Flood Estimation- Frequency analysis- Flood control- Definitions of droughts- Meteorological, Hydrological and Agricultural droughts- IMD method-NDVI analysis- Drought Prone Area Programme (DPAP)		
Unit IV	Reservoirs	08
Classification of reservoirs, General principles of design, Site selection, Spillways, Elevation – Area - Capacity - Storage estimation, Sedimentation - Life of reservoirs – Rule curve		
Unit V	Groundwater and Management	08
Origin- Classification and types - Properties of Aquifers- Governing equations – Steady and unsteady flow - Artificial recharge - RWH in rural and urban areas		

Text Books	1. Subramanya.K. "Engineering Hydrology"- Tata McGraw Hill, 2010 2. Jayarami Reddy P. "Hydrology", Tata McGraw Hill, 2008. 3. Linsley, R.K. and Franzini, J.B. "Water Resources Engineering", McGraw Hill International Book Company, 1995.
Reference Books	1. David Keith Todd. "Groundwater Hydrology", John Wiley & Sons, Inc. 2007 2. VenTe Chow, Maidment, D.R. and Mays, L.W. "Applied Hydrology", McGraw Hill International Book Company, 1998. 3. Raghunath .H.M., "Hydrology", Wiley Eastern Ltd., 1998.
Mode of Evaluation	Internal and External Examination
Recommendation by Board of Studies on	28-05-2022
Date of approval by the Academic Council	20/10/2022

Course Outcome for CE3706

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Student should be able to understand the concept of precipitation.	2	Em
CO2	Student should be able to understand the concept of runoff.	2	S
CO3	Student should be able to understand the concept of flood and drought.	2	S
CO4	Student should be able to understand the concept of reservoirs.	2	En
CO5	Student should be able to understand the concept of groundwater and management	1	None

CO-PO Mapping for CE3706

Course Outcomes	Program Outcomes (Course Articulation Matrix(Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	1	2	1	3	2	1	3	3	3	3	2	2	1
CO 2	2	2	1	1	3	2	3	2	2	2	1	1	1	1
CO 3	2	3	1	2	3	2	2	1	3	3	2	1	1	3
CO 4	2	1	3	1	2	2	1	3	3	2	2	2	3	2
CO 5	2	1	2	2	2	3	1	3	3	2	2	3	2	2
Avg.	2	1.6	1.8	1.4	2.6	2.2	1.6	2.4	2.8	2.4	2	1.8	1.8	1.8

CE3707	Title: Irrigation Engineering	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To impart knowledge regarding hydrology, Flow irrigation – Storage and distribution system, constructional features of head works, River training works, Cross drainage works, Causes and prevention of water logging and construction of tube wells.	
Expected Outcome	• Student should be able to understand the concept of water crop requirement. • Student should be able to understand the concept of hydrological cycle and method of Irrigation. • Student should be able to understand the concept of Canal and Tube Well Irrigation. • Student should be able to understand the concept of Dams, Weir, and Barrage, its components and methods of construction. • Student should be able to understand the necessity of aqueduct, crossing, pipes,etc.	
Unit No.	Unit Title	No. of hours (Per Unit)
Unit I	Introduction And Water Crop Requirement	8
Definition and necessity of irrigation, History of development of Irrigation in India, Major, medium and minor rigation projects, Principal crops in India and their water requirements, Duty, Delta and base period, Gross ommanded area (GCA), Cultivable commanded area (CCA).		
Unit II	Hydrological Cycle and Method of Irrigation	6
Rainfall, Types of rain, Catchment area runoff, Factors affecting runoff, Hydrograph, Basic concept of unit hydrograph, Flow irrigation, Lift Irrigation, Sprinkler irrigation, Drip irrigation, Component parts and advantages.		
Unit III	Canal and Tube Well Irrigation	8
Classification of a canal and their functions, Maintenance of lined and unlined canals, Water table, Radius of Influence, Depression head, Cone of depression, Confined and unconfined aquifers, Water harvesting techniques, Runoff from roof top and ground surface, Techniques for ground water recharge, Construction of recharge pits and recharge wells and their maintenance.		
Unit IV	Dams, Canal Head Works and Regulatory Works	6
Classification of dams, Method of construction, Concept of small and micro dams, Concept of spillways and energy dissipaters, Difference between weir and barrage.		
Unit V	Cross Drainage Works, Definitions of Hydraulic Structures with Sketches	8
Functions and necessity of the following types: Aqueduct, Super passage, Level crossing, Inlet and outlet, Pipe crossing, Sketches of the above cross drainage works Falls, Cross and head regulators, Outlets, Canal Escapes.		
Text Books	1. Bharat Singh, `Fundamentals of Irrigation Engineering', Nem Chand and Bros, Roorkee.	
Reference Books	1. Saharsabudhe SR, “Irrigation Engineering and Hydraulic Structures” 2. Central Ground Water Board and Central Water Commission Guidelines Books. 3. Punmia, BC; and PandeBrijBansiLal, `Irrigation and Water Power Engineering', Delhi, Standard Publishers Distributors, Delhi.	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by the Academic Council	20/10/2022	

Course Outcome for CE3707

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Student should be able to understand the concept of water crop requirement.	2	Em
CO2	Student should be able to understand the concept of hydrological cycle and method of Irrigation.	2	S
CO3	Student should be able to understand the concept of Canal and Tube Well Irrigation.	2	S
CO4	Student should be able to understand the concept of Dams, Weir, and Barrage, its components and methods of construction.	2	En
CO5	Student should be able to understand the necessity of aqueduct, crossing, pipes etc.	1	None

CO-PO Mapping for CE3707

Course Outcomes	Program Outcomes (Course Articulation Matrix(Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	3	3	3	1	2	1	2	1	3	2	2	1	3
CO 2	1	1	2	2	3	1	3	1	1	2	2	3	2	1
CO 3	3	1	1	3	2	3	1	1	1	2	1	2	1	3
CO 4	1	3	2	2	3	3	1	2	3	3	2	1	1	2
CO 5	2	2	3	3	3	3	2	3	3	1	3	2	2	3
Avg.	1.8	2	2.2	2.6	2.4	2.4	1.6	1.8	1.8	2.2	2	2	1.4	2.4

CE3712	Title: Urban Hydrology and Hydraulics	L T P C 3 0 03
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To give knowledge on Hydrological Cycle and various hydraulic structures.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit: I	Introduction	8
irrigation, water resources in India, need of irrigation in India, development of irrigation in India, impact of irrigation on human environment, irrigation systems: minor and major, command area development		
Unit II	Ground water and well hydrology	7
Ground water resources, occurrence of ground water, methods of ground water exploration, well irrigation; Well hydraulics: steady state flow in wells, equilibrium equations for confined and unconfined aquifers, aquifer tests, design of water wells.		
Unit III	Distribution system	7
Canal systems, alignment of canals, canal losses, estimation of design discharge. Design of channels-rigid boundary channels carrying clear and sediment laden water, alluvial channels carrying clear and sediment laden water, Kennedy‟s and Lacey‟s theory of regime channels. Canal outlets: non-modular, semi-modular and modular outlets. Water logging: causes, effects and remedial measures. Lining of canals economics of lining, types of lining. Drainage of irrigated lands: necessity, method		
Unit IV	Canal head works	7
Weir and barrage, different units of head works, types of weirs, sediment control in canals, river training for canal head works. Theories of seepage for design of weirs: Bligh‟s creep theory, Lane‟s weighted creep theory, Khosala‟s method of independent variables.		
Unit V	Dams and spillways	7
-Embankment dams: Classification, selection of site for dam, design considerations, estimation and control of seepage, slope protection. Gravity dams: forces on gravity dams, causes of failure, stress analysis		
Text Books	S K Garg, Irrigation Engineering & Hydraulic Structures, Khanna Publishers	
Reference Books	1. G L Asawa, Irrigation Engineering, Wiley Eastern 2. P N Modi, Irrigation Engineering & Hydraulic Structure	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by the Academic Council	20/10/2022	

Course Outcome for CE3712

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Student should be able to able to understand the importance of Urban Hydrology and Hydraulics	2	S
CO2	Student should be able to able to understand the concept of Ground water and well hydrology	2	S
CO3	Student should be able to able to understand the concept of Distribution system, flow in bends of stream and their models	2	S
CO4	Student should be able to able to understand about the Canal head works	2	S
CO5	Student should be able to able to understand the use of Dams and spillway	2	S

CO-PO Mapping for CE3712

Course Outcomes	Program Outcomes (Course Articulation Matrix(Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	1	3	1	3	3	1	1	1	1	2	3	3	1	1
CO 2	1	2	3	3	3	1	2	1	2	3	2	3	3	3
CO 3	3	3	2	3	2	3	2	3	1	3	3	2	2	1
CO 4	2	1	2	3	2	3	1	3	2	1	1	1	2	3
CO 5	3	3	2	2	2	1	3	2	1	3	3	2	2	3
Avg.	2	2.4	2	2.8	2.4	1.8	1.8	2	1.4	2.4	2.4	2.2	2	2.2

CE3713	Title: Open Channel Flow	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To give knowledge on Open channel flow	
Unit No.	Unit Title	No. of hours (per Unit)
Unit: I	Basic Equations	8
Introduction, Types of channels. Governing equations. Basic hypotheses, Hydrostatic pressure distribution. Differential continuity equation. Differential momentum equation. Differential mechanical-energy equation. Momentum and energy coefficients. Governing equations for specific flows, Steady uniform flow, Steady Varied flow, Unsteady uniform flow, Unsteady varied flow. Algebraic equations of motion, Continuity equation, Momentum equation, Energy equation, Application. Pressure distribution in curvilinear flow		
Unit II	Steady Uniform Flow	7
Governing equations. Open-channel resistance, Manning equation. Normal depth, Compound channels. Equivalent roughness. Best hydraulic section, trapezoidal section. Design of channels.		
Unit III	Control Section	7
Propagation of disturbances, Celerity of small disturbance, Upstream propagation of disturbance, Hydraulic jump. Channel transitions, Specific energy, Critical depth, Rectangular channels, Compound channels, Change in bottom elevation, Change in channel width, Control structures. Locations and types of control sections, Flow profiles without channel resistance		
Unit IV	Gradually Varied Flow	7
Governing equations. Classification of flow profiles, Backwater and drawdown curves. Characteristics of flow profiles, Water-surface slope at zonal boundaries, Shapes of flow profiles, Mechanism of specific energy gain. Sketching flow profiles, Prismatic channel with change in slope and roughness, Interaction of controls, Profiles in Channels with transitions. No unique water- surface profiles, Mild downstream reach, Steep downstream reach. Profile analysis for given total head, Flow in a long channel, Effect of a downstream control. Location of hydraulic jump. Profiles in compound channels.		
Unit V	Hydraulic Jump	7
Contractions and expansions, Subcritical flow, Supercritical flow. Flow in bends, Subcritical flow, Supercritical flow. Hydraulic jump, Energy loss in the jump, Types of jumps, Length of the jump, Surface profile of the jump, Control of the jump, Stilling basins. Flow through culverts, Discharge equations, coefficient of discharge. Surges in power canals, Meeting of two surges, Surge due to sudden load rejection. Roll waves		
Text Books	Open channel flow, Vol. I, K. subramanium.	
Reference Books	Open channel flow, Krishna Raju, Surface water flow , Arthur P D &Ramkrishnan V, Wheeler & Co.	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by the Academic Council	20/10/2022	

Course Outcome for CE3713

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Student should be able to know the basic knowledge about the subject.	2	S
CO2	Students should be able to understand the concept of	2	S
CO3	Students should be able to understand the concept of Control Section	2	S
CO4	Students should be able to understand the concept of Gradually Varied Flow	2	S
CO5	Students should be able to understand the concept of Hydraulic Jump	2	S

CO-PO Mapping for CE3713

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	1	2	2	2	2	1	2	2	2	1	1	2	1	3
CO 2	3	3	3	1	3	2	2	1	2	1	3	1	2	1
CO 3	2	3	3	2	2	1	2	3	1	2	3	3	1	2
CO 4	3	2	3	1	3	3	1	2	3	3	2	1	3	2
CO 5	3	1	1	3	1	1	2	2	3	3	2	2	2	2
Avg.	2.4	2.2	2.4	1.8	2.2	1.6	1.8	2	2.2	2	2.2	1.8	1.8	2

CE3714	Title:Hydraulic Modelling	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To give knowledge on Hydraulic Modelling	
Unit No.	Unit Title	No. of hours (per Unit)
Unit: I	Hydrologic Modelling Overview	8
the hydrological cycle as a mass balance problem - component models - integrated/differential models – conceptual vs. physically-based models - the modelling process - basic model numeric - the challenge of predictive modelling - up scaling - survey of commonly used Canadian models		
Unit II	Inputs & Data Preprocessing – Temporal	7
common forcing data - rain/snow partitioning - ET estimation - radiation/potential melt estimation - spatial Interpolation - dealing with missing data - generating future scenarios - time series basics - timestamp woes - Canadian forcing data – data issues - downscaling		
Unit III	Inputs & Data Preprocessing - Spatial	7
terrain and drainage analysis – sub basin& HRU delineation - contributing areas - system discretization - Indian data resources overview - land use and soil data - - spatial data issues – value of information - parameterization		
Unit IV	Model Operation & Application – Single Basin	7
energy balances - snowmelt models - soil infiltration and redistribution models - Canadian hydrologic landscapes - hypothesis testing - case studies from industry		
Unit V	Model Operation & Application - Distributed Modelling	7
routing methods - overland flow and travel times - reservoirs, lakes, and managed systems - challenges in cold regions – flood prediction - hydropower application - case studies from industry		
Text Books		
Reference Books		
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by the Academic Council	20/10/2022	

Course Outcome for CE3714

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Student should be able to understand the concept of Hydrologic Modelling Overview	2	S
CO2	Student should be able to understand the concept of Inputs & Data Preprocessing – Temporal	2	S
CO3	Student should be able to understand the concept of Inputs & Data Preprocessing – Spatial.	2	S
CO4	Student should be able to understand the concept of. Model Operation & Application – Single Basin	2	S
CO5	Student should be able to understand the concept of Model Operation & Application - Distributed Modelling	2	S

CO-PO Mapping for CE3714

Course Outcomes	Program Outcomes (Course Articulation Matrix(Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	3	3	3	1	2	1	2	1	3	2	2	1	3
CO 2	1	1	2	2	3	1	3	1	1	2	2	3	2	1
CO 3	3	1	1	3	2	3	1	1	1	2	1	2	1	3
CO 4	1	3	2	2	3	3	1	2	3	3	2	1	1	2
CO 5	2	2	3	3	3	3	2	3	3	1	3	2	2	3
Avg.	1.8	2	2.2	2.6	2.4	2.4	1.6	1.8	1.8	2.2	2	2	1.4	2.4

CE3742	Title: **Technical VAP II**	L T P C 2 0 0 2
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	The course aims brush-up the topics important in terms of placement activity.	
Expected Outcome	• Student should be able to apply the engineering knowledge to attain the problem solving skills required during the placement drives. • Student should be able to develop ability to face technical interviews. • Student should be able to know the types of technical questions asked by the companies in the placement drives.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit: 1	**Construction Management**	6
Construction equipment's, PERT & CPM in construction management, Rate analysis, prefabricated structures		
Unit II	**Building by laws**	6
Building codes, IS456:2000, IS132, IS800:2007		
Unit III	**Structure Analysis**	6
ILD. Arches, Trusses		
Unit IV	**Prestressed Concrete**	3
Pre-tensioning & Post tensioning, System of prestress		
Unit V	**Surveying**	3
Levelling, Contouring & Application of TS, GIS, GPS & Remote sensing		
Mode of Evaluation	Internal and External Examination	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by the Academic Council	20/10/2022	

Course Outcome for CE3742

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to solve complex civil engineering problems.	2	Em
CO2	Students should be able to give answers of technical questions	2	S
CO3	Students should be able to learn to prepare a PowerPoint presentation on the training.	2	S
CO4	Students should be able to learn to prepare and submit a report on the training.	2	En
CO5	Students should learn the different concepts and ideas.	1	None

CO-PO Mapping for CE3742

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	1	2	1	3	2	2	1	1	3	3	3	3	3	3
CO 2	2	2	3	2	2	2	3	2	2	1	1	2	3	1
CO 3	3	2	3	1	3	1	1	3	3	2	3	1	2	2
CO 4	1	3	1	1	2	1	2	2	1	2	2	3	2	1
CO 5	2	1	2	3	1	1	1	2	1	2	2	1	2	2
Avg.	1.8	2	2	2	2	1.4	1.6	2	2	2	2.2	2	2.4	1.8

SEMESTER-8

CE3801	**Title: Environmental Impact Assessment**	**L T P C** **3 0 0 3**
Version No.	**1.0**	
Course Prerequisites	**Nil**	
Objectives	To impart knowledge on Environmental management and Environmental Impact Assessment To impart knowledge about various Environmental Impact Assessment procedures & steps	
Expected Outcome	• Student should be able to able to carry out scoping and screening of developmental projects for environmental and social assessments • Student should be able to able to explain different methodologies for environmental impact prediction and assessment • Student should be able to able to plan environmental impact assessments and environmental management plans • Student should be able to able to evaluate environmental impact assessment reports • Student should be able to able to understand the different the case studies	
Unit No.	**Unit Title**	**No. of hours (Per Unit)**
Unit: I	**Introduction**	08
Impact of development projects – Sustainable development- Need for Environmental Impact Assessment (EIA) - Environmental Impact Statement (EIS) – EIA capability and limitations – Legal provisions on EIA-Stages of EIA, Types of EIA		
Unit II	**Methodologies**	08
Methods of EIA – Check lists – Matrices – Networks – Cost-benefit analysis – Analysis of alternatives		
Unit III	**Prediction And Assessment**	08
Assessment of Impact on land, water, air, social & cultural activities and on flora & fauna- Mathematical models- Public participation.		
Unit IV	**Environmental Management Plan**	08
Plan for mitigation of adverse impact on environment – Options for mitigation of impact on water, air, land and on flora & fauna - Addressing the issues related to the Project Affected People, Post project monitoring		
Unit V	**Case Studies**	08
EIA for infrastructure projects – Dams – Highways – Multi-story Buildings – Water Supply and Drainage Projects – Waste water treatment plant.		
Text Books	1. Canter, R.L., "Environmental Impact Assessment", McGraw Hill Inc., New Delhi, 1996. 2. Shukla, S.K. and Srivastava, P.R., "Concepts in Environmental Impact Analysis", Common Wealth Publishers, New Delhi, 1992.	
Reference Books	1. John G. Rau and David C Hooten "Environmental Impact Analysis Handbook", McGraw Hill Book Company, 1990. 2. "Environmental Assessment Source book", Vol. I, II & III. The World Bank, Washington, D.C., 1991. 3. Judith Petts, "Handbook of Environmental Impact Assessment Vol. I & II", Blackwell Science, 1999.	
Mode of Evaluation	Internal and External Examination	
Recommendation by	28-05-2022	

Board of Studies on	
Date of approval by the Academic Council	20/10/2022

Course Outcome for CE3801

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Student should be able to able to carry out scoping and screening of developmental projects for environmental and social assessments	2	Em
CO2	Student should be able to able to explain different methodologies for environmental impact prediction and assessment	2	S
CO3	Student should be able to able to plan environmental impact assessments and environmental management plans	2	S
CO4	Student should be able to able to evaluate environmental impact assessment reports	2	En
CO5	Student should be able to able to understand the different the case studies	1	None

CO-PO Mapping for CE3801

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	3	2	2	1	1	1	2	1	3	1	2	1	2
CO 2	1	1	3	1	1	3	1	3	2	1	3	3	1	2
CO 3	3	3	2	2	2	3	1	2	1	3	2	2	1	2
CO 4	1	3	1	3	2	1	2	2	3	3	2	1	2	2
CO 5	2	2	1	2	3	3	1	2	3	2	3	2	1	3
Avg.	2	2.4	1.8	2	1.8	2.2	1.2	2.2	2	2.4	2.2	2	1.2	2.2

CE3802	Title:Groundwater Improvement Technology	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To impart knowledge on groundwater movement, development of ground water resources hydro chemical behavior of contaminants and the principals involved in contaminant transport through groundwater.	
Expected Outcome	• Student should be able to know the basic knowledge about the subject. • Student should be able to analyze the ground water flow. • Student should be able to understand the investigations of surface and subsurface water. • Student should be able to understand the concept of artificial recharge. • Student should be able to know about the saline water intrusion.	
Unit No.	Unit Title	No. of hours (Per Unit)
Unit: I	Introduction	8
Ground water occurrence and movement: Ground water hydrologic cycle, Origin of ground Water, Rock properties affecting ground water, Vertical distribution of ground water, Zone of aeration and zone of saturation, Geologic formation as Aquifers, Types of aquifers, Porosity, Specific yield and Specific retention. Permeability, Darcy's law, Storage coefficient, Transmissivity, Differential equation governing ground water, Flow in three dimensions derivation, Ground water flow equation in polar coordinates system, Ground water flow contours their applications.		
Unit II	Data Analysis	8
Steady flow ground water flow towards a well in confined and unconfined aquifers, Assumptions, Formation constants, Yield of an open well interface and well tests, Unsteady flow towards a well		
Unit III	Investigations	8
Surface and Subsurface Investigation: Surface methods of exploration-Electrical resistivity and Seismic refraction methods. Subsurface methods-geophysical logging and resistivity logging. Aerial Photogrammetry applications along with Case Studies in Subsurface Investigation.		
Unit IV	Artificial Recharge	8
Artificial Recharge of Ground Water: Concept of artificial recharge- recharge methods, Relative merits. Applications of GIS and Remote Sensing in Artificial Recharge of Ground water.		
Unit V	Saline Water Intrusion	8
Saline Water Intrusion In aquifers: Occurrence of saline water intrusions, Ghyben-Herzberg relation, Shape of interface, Control of seawater intrusion.		
Text Books	1. Randall J. Charbeneau-Ground water Hydraulics and Pollutant Transport, Prentice Hall. Inc, 1999 2. Remson I.,Hornberger G.M. and MoltzF.J.,"Numerical Methods in Subsurface Hydrology", Wiley, New York, 1971	
Reference Books	1. Allen Freeze R. and John A. Cherry "Ground water. Prentice Hall. Inc, 1979 2. Raghunath, H.M., Ground Water, 2nd edition, Wiley Eastern Ltd., New Delhi, 1987. 3. Rushton K.R., "Groundwater Hydrology" Conceptual and Computational Models, Wiley, 2003 4. Elango L. and Jayakumar, R. "Modelling in Hydrology", Allied Publishers Ltd., 2001	
Mode of Evaluation	Internal and External Examination	

Recommendation by Board of Studies on	28-05-2022
Date of approval by the Academic Council	20/10/2022

Course Outcome for CE3802

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Student should be able to know the basic knowledge about the subject.	2	Em
CO2	Student should be able to analyze the ground water flow.	2	S
CO3	Student should be able to understand the investigations of surface and subsurface water.	2	S
CO4	Student should be able to understand the concept of artificial recharge.	2	En
CO5	Student should be able to know about the saline water intrusion.	1	None

CO-PO Mapping for CE3802

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	3	3	1	2	3	1	2	1	1	3	2	1	2
CO 2	3	2	3	2	2	3	3	1	1	3	3	2	2	1
CO 3	2	1	3	2	1	2	1	3	1	2	1	2	2	2
CO 4	3	2	2	3	2	3	1	2	2	2	2	1	2	3
CO 5	1	3	2	3	2	1	1	2	2	1	2	2	3	1
Avg.	2.4	2.2	2.6	2.2	1.8	2.4	1.4	2	1.4	1.8	2.2	1.8	2	1.8

CE3811	Title: **Water and air quality modeling**	L T P C 3 0 0 3
Version No.	**1.0**	
Course Prerequisites	**Nil**	
Objectives	the students will be knowing the modeling concept of air and water quality and its applicability in the Control of Air and Water pollution	
Unit No.	**Unit Title**	**No. of hours (per Unit)**
Unit: I	**Introduction**	8
Water Quality, Water quality characteristics, sampling and analysis, Analytical methods, Automated analysis and remote monitoring.		
Unit II	**Air Quality Modelling**	7
Modelling for nonreactive pollutants, single source, short term impact, multiple sources and area sources, Metrological Modelling – Diagnostic Models -Prognostic Models – diffusion models, modifications of Gaussian plume equation -long term average- receptor oriented and source oriented air pollution models, Numerical Models, model performance, accuracy and utilization.		
Unit III	**Water Quality Models**	7
Mass balance equation -Mathematics of Pollutant Transport – Advection- dispersion-In-Water Transformation- Waste load allocations – Basic mechanisms of river self-purification, Dissolved Oxygen dynamics Streeter-Phelps and Dobbins models, Pollutant and nutrient dynamics, Temperature dependence and transport, Dissolved oxygen in Rivers and estuaries; Lake Water Quality Models; Models for Nitrogen, Bacteria, Phosphate and toxicants – Ground Water Quality Modelling – Contaminant solute transport equation, Numerical methods.		
Unit IV	**Water Quality Management**	7
Water quality objectives and standards, Water quality control models, Flow augmentation, River and Lake water quality Models, Groundwater quality Models, Wastewater Transport Systems.		
Unit V	**Legal Aspects of Water quality:**	7
Water pollution control acts and Legislation.		
Text Books	Deaton, M.L and Winebrake, J.J., Dynamic Modelling of Environmental Systems, Verlag, 2000	
Reference Books	1. Chapra, S.C. Surface Water-Quality Modelling, McGraw-Hill, 2008. 2. Arthur C.Stern., Air Pollution (Third Ed.) Volume I – Air Pollutants, their transformation and Transport, (Ed.), Academic Press, 2006.	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by the Academic Council	20/10/2022	

Course Outcome for CE3811

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Student should be able to able to understand the basic knowledge about the subject	2	Em
CO2	Student should be able to able to understand the Air Quality Modelling	2	S
CO3	Student should be able to able to understand the Water Quality Models	2	S
CO4	Student should be able to able to understand the Water Quality Management	2	En
CO5	Student should be able to able to understand the Legal Aspects of Water quality	2	S

CO-PO Mapping for CE3811

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	3	2	2	1	1	1	2	1	3	1	2	1	2
CO 2	1	1	3	1	1	3	1	3	2	1	3	3	1	2
CO 3	3	3	2	2	2	3	1	2	1	3	2	2	1	2
CO 4	1	3	1	3	2	1	2	2	3	3	2	1	2	2
CO 5	2	2	1	2	3	3	1	2	3	2	3	2	1	3
Avg.	2	2.4	1.8	2	1.8	2.2	1.2	2.2	2	2.4	2.2	2	1.2	2.2

CE3812	Title: **Solid and Hazardous Waste Management**	L T P C 3 0 0 3
Version No.	**1.0**	
Course Prerequisites	**Nil**	
Objectives	Define the terms and Understands the necessity of solid waste management Explain the strategies for the collection of solid waste Describe the solid waste disposal methods Categorize Hazardous Waste	
Unit No.	**Unit Title**	**No. of hours (per Unit)**
Unit: I	**Solid Waste**	8
Definitions, Types of solid wastes, sources of solid wastes, Characteristics, and perspectives; properties of solid wastes, Sampling of Solid wastes, Elements of solid waste management – Integrated solid waste management, Solid Waste Management Rules 2016.		
Unit II	**Engineering Systems for Solid Waste Management**	7
Solid waste generation; on-site handling, storage and processing; collection of solid wastes; Stationary container system and Hauled container systems – Route planning – transfer and transport; processing techniques;		
Unit III	**Engineering Systems for Resource and Energy Recovery**	7
Processing techniques; materials recovery systems; recovery of biological conversion products – Composting, pre and post processing, types of composting, Critical parameters, Problems with composing – recovery of thermal conversion products; Pyrolisis, Gasification, RDF – recovery of energy from conversion products; materials and energy recovery systems.		
Unit IV	**Landfills**	7
Evolution of landfills – Types and Construction of landfills – Design considerations – Life of landfills- Landfill Problems – Lining of landfills – Types of liners – Leachate pollution and control – Monitoring landfills – Landfills reclamation.		
Unit V	**Hazardous waste Management**	7
Sources and characteristics, Effects on environment, Risk assessment – Disposal of hazardous wastes – Secured landfills, incineration – Monitoring – Biomedical waste disposal, E-waste management, Nuclear Wastes, Industrial waste Management		
Text Books	Tchobanoglous G, Theisen H and Vigil SA 'Integrated Solid Waste Management, Engineering Principles and Management Issues' McGraw-Hill, 1993.	
Reference Books	Peavy, H.S, Rowe, D.R., and G. Tchobanoglous, 'Environmental Engineering', McGraw Hill Inc., New York, 1985. Qian X, Koerner RM and Gray DH, 'Geotechnical Aspects of Landfill Design and Construction' Prentice Hall, 2002.	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by the Academic Council	20/10/2022	

Course Outcome for CE3812

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Student should be able to understand the concept of Solid Waste	2	Em
CO2	Student should be able to understand the Engineering Systems for Solid Waste Management	2	S
CO3	Student should be able to understand the Engineering Systems for Resource and Energy Recovery	2	S
CO4	Student should be able understand the concept of Landfills	2	En
CO5	Student should be able to understand the concept of Hazardous waste Management	2	s

CO-PO Mapping for CE3812

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	1	2	1	1	1	1	2	3	3	3	3	3	3
CO 2	2	1	2	1	1	3	2	3	1	2	3	3	2	1
CO 3	1	1	3	3	2	2	3	2	2	2	2	3	3	3
CO 4	3	1	3	2	3	2	2	2	3	2	2	1	3	2
CO 5	3	1	1	1	2	1	2	3	3	1	1	3	3	1
Avg.	2.4	1	2.2	1.6	1.8	1.8	2	2.4	2.4	2	2.2	2.6	2.8	2

CE3814	Title: **Air and Noise Pollution and Control**	**L T P C** **3 0 0 3**
Version No.	**1.0**	
Course Prerequisites	**Nil**	
Objectives	the students will be knowing the modeling concept of air quality and its applicability in the Control of Air and Noise pollution	
Unit No.		**No. of hours (per Unit)**
Unit: I	**Air pollution:**	8
Composition and structure of atmosphere, global implications of air pollution. Classification of air pollutants: particulates, hydrocarbon, carbon monoxide, oxides of sulphur, oxides of nitrogen and photo chemical oxidants. Indoor air pollution, Effects of air pollutants on humans, animals, property and plants.		
Unit II	**Air pollution chemistry, meteorological aspects of air pollution dispersion**	7
Temperature lapse rate and stability, wind velocity and turbulence, plume behavior, dispersion of air pollutants, the Gaussian Plume Model, stack height and dispersion.		
Unit III	**Ambient air quality and standards, air sampling and measurements**	7
Ambient air sampling, collection of gaseous air pollutants, collection of particulate air pollutants, stacksampling.Control devices for particulate contaminants: gravitational settling chambers, ycloneeseparators, wet collectors, fabric filters (Bag-house filter), electrostatic precipitators (ESP).		
Unit IV	**Control of gaseous contaminants:**	7
Absorption, Adsorption, Condensation and Combustion, Control of sulphur oxides, nitrogen oxides, carbon monoxide, and hydro carbons. Automotive emission control, catalytic convertor, Euro-I, Euro-II and Euro-III specifications, Indian specifications.		
Unit V	**NOISE POLLUTION:**	7
Basics of acoustics and specification of sound; sound power, sound intensity and sound pressure levels; plane, point and line sources, multiple sources; outdoor and indoor noise propagation; psycho-acoustics and noise criteria, effects of noise on health, annoyance rating schemes; special noise environments: Infra-sound, ultrasound, impulsive sound and sonic boom; noise standards and limit values; noise instrumentation and monitoring procedure. Noise indices.		
Text Books	My cock, Mc Kenna and Theodore: Handbook of Air Pollution Control Engineering and Technology. Suess and Crax ford: W.H.O. Manualon Urban Air Quality Management	
Reference Books	1. Peavy, Rowe and Tchobanoglous: Environmental Engineering. 2. Martin Crawford: Air Pollution Control Theory.	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by the Academic Council	20/10/2022	

CO-PO Mapping for CE3814

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students will be able to understand basic concepts of Air pollution, their causes, sources & effects on health.	2	Em
CO2	Students will be able to understand about Air pollution chemistry, meteorological aspects of air pollution dispersion	2	S
CO3	Students will be able to understand the concepts of. Ambient air quality and standards, air sampling and measurements	2	S
CO4	Students will be able to understand basic concepts of Control of gaseous contaminants:	2	En
CO5	Students will be able to understand basic knowledge of Noise pollution	2	S

CO-PO Mapping for CE3814

Course Outcomes	Program Outcomes (Course Articulation Matrix(Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	1	2	2	1	2	1	3	1	3	3	2	1	1
CO 2	2	1	2	2	3	2	3	3	1	1	1	1	2	1
CO 3	1	1	2	3	2	1	1	1	1	2	2	1	2	2
CO 4	1	1	2	3	3	2	3	2	3	1	3	1	3	3
CO 5	2	1	3	3	2	1	2	2	2	1	3	1	2	2
Avg.	1.6	1	2.2	2.6	2.2	1.6	2	2.2	1.6	1.6	2.4	1.2	2	1.8

CE3815	Title:Sustainable Engineering & Technology	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To enable students to understand the Concept of sustainability and sustainability goals	
Unit No.		No. of hours (per Unit)
Unit: I	Sustainability	8
Introduction, Need and concept of sustainability, Social environmental and economic sustainability concepts. Development, Nexus between Technology and Sustainable development, Challenges for Sustainable Development. Multilateral environmental agreements and Protocols - Clean Development Mechanism (CDM), Environmental legislations in India - Water Act, Air Act.		
Unit II	Pollution and carbon foot print	7
Air Pollution, Effects of Air Pollution; Water pollution- sources, Sustainable wastewater treatment, Solid waste - sources, impacts of solid waste, Zero waste concept, 3 R ch.conesart 0 Global environmental issues- Resource degradation, Climate change, Global warming, Ozone layer depletion, Regional and Local Environmental Issues. Carbon credits and carbon trading, carbon foot print.		
Unit III	Environment Impact Assessment	7
Environmental management standards, ISO 14000 series, Life Cycle Analysis (LCA) - Scope and Goal, Bio-mimicking, Environment Impact Assessment (EIA) - Procedures of EIA in India.		
Unit IV	Green building	7
Basic concepts of sustainable habitat, Green buildings, green materials for building construction, material selection for sustainable design, green building certification, Methods for increasing energy efficiency of buildings. Sustainable cities, Sustainable transport.		
Unit V	Green Engineering	7
Green Engineering. Sustainable Urbanization, industrialization and poverty reduction; Social and technological change, Industrial Processes: Material selection, Pollution Prevention, Industrial Ecology, Industrial symbiosis.		
Text Books	PanneerSelvam, R, “Sustainable Engineering”, Prentice Hall of India Ltd, New Delhi, 2001.	
Reference Books	Degarmo, E.P., Sullivan, W.G and Canada, J.R, “Green Engineering”, Macmillan, New York, 2011. Zahid A khan: Engineering Economy, “Recycling Engineering ”, Dorling Kindersley, 2012	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	28-05-2022	
Date of approval	20/10/2022	

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Course Outcome for CE3815

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Student should be able to understand the concept of Sustainability	2	Em
CO2	Student should be able to understand the concept of Pollution and carbon foot print	2	S
CO3	Student should be able to understand the concept of Environment Impact Assessment	2	S
CO4	Student should be able to design the Green building	2	En
CO5	Student should be able to understand the concept of Green Engineering	2	S

CO-PO Mapping for CE3815

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	1	2	1	1	1	1	2	3	3	3	3	3	3
CO 2	2	1	2	1	1	3	2	3	1	2	3	3	2	1
CO 3	1	1	3	3	2	2	3	2	2	2	2	3	3	3
CO 4	3	1	3	2	3	2	2	2	3	2	2	1	3	2
CO 5	3	1	1	1	2	1	2	3	3	1	1	3	3	1
Avg.	2.4	1	2.2	1.6	1.8	1.8	2	2.4	2.4	2	2.2	2.6	2.8	2

CE3804	Title:Advance Transportation Engineering	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	Understand traffic safety is the foremost important agenda when we design transportation facilities and be able to estimate the effectiveness of safety design features.	
Expected Outcome	• Student should be able to analyze the traffic engineering. • Student should be able to forecast the future traffic and parking area. • Student should be able to understand about the airport engineering. • Student should be able to design the airport. • Student should be able to understand about the docks and harbor engineering.	
Unit No.	Unit Title	No. of hours (Per Unit)
Unit: 1	Traffic Engineering	8
Scope of traffic engineering, Vehicular characteristics, Road users' characteristics, Necessity of traffic studies, Origin and destiny survey (O.D. Survey), Volume Study, Explain travel time and delay study, Accidents studies, Parking studies, Traffic signal design studies ROAD MARKINGS: - Function, Types of road marking, General principle of pavement markings, Material and Colour, Center lines, stop lines, traffic lane lines, No overtaking zone marking		
Unit II	Parking And Traffic Forecasting	8
Traffic and parking problem, Ill effects of parking, Zoning and parking space requirement standards, Design standards for on street parking facilities, Different types of parking, Traffic Forecasting, Need for traffic forecasting, Limitations of traffic forecasting, Types of traffic, Period of forecasting		
Unit III	Airport Engineering	8
Significance and importance of aircraft characteristics, Explanation of (Type of propulsion, Size of Aircraft, Weights of Aircraft.), Capacity of aircraft, Speed characteristics, Turning radius, Fuel spillage, Heat blast and noise, Aircraft circling radius		
Unit IV	Design Criteria	8
Airport in regional planning, Airport in city planning, Elements of airport planning, Facilities of passengers and baggage, Airport capacity, Necessity, explain wind rose diagram, Geometric design of runway and taxiway, Classification of apron according to use		
Unit V	Docks And Harbor Engineering	8
Natural phenomenon: - Wind, Tide, Current, Types of harbour, Choice of site for harbor, Master plan for port planning, Hydrographic and topographic survey, Necessities for fenders, Energy absorbed by fenders during berthing, Types of fender system, Mooring system		
Text Books	1. "Traffic engineering and Transportation planning", by Dr. L. R. Kadiyali, 7 th edition, Khanna Publishers 2. "Roads, Railways, Bridges, Tunnels &Harbour Dock Engineering", by B. L. Gupta & Amit Gupta, 5 th edition, Standard Publishers	
Reference Books	1. Dock and Harbour Engineering", by H. P. Oza& G.H. Oza, 5th edition, Charotar Publisher 2. "Airport Engineering", by Rangwala, 11th edition, Charotar Publisher	
Mode of Evaluation	Internal and External Examination	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by	20/10/2022	

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Course Outcome for CE3804

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Student should be able to understand the traffic engineering.	2	Em
CO2	Student should be able to forecast the future traffic and parking area.	2	S
CO3	Student should be able to understand about the airport engineering.	2	S
CO4	Student should be able to design the airport.	2	En
CO5	Student should be able to understand about the docks and harbor engineering.	2	S

CO-PO Mapping for CE3804

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	2	2	1	3	1	2	3	1	3	3	1	2	3
CO 2	3	1	2	3	2	1	3	2	3	2	2	2	1	3
CO 3	2	3	1	2	2	3	3	3	3	2	3	2	2	3
CO 4	2	3	2	2	2	2	2	1	1	1	1	3	1	1
CO 5	2	3	1	2	2	3	2	2	3	3	1	1	2	2
Avg.	2.4	2.4	1.6	2	2.2	2	2.4	2.2	2.2	2.2	2	1.8	1.6	2.4

CE3816	Title: **Pavement Materials**	L T P C 3 0 0 3
Version No.	**1.0**	
Course Prerequisites	**Nil**	
Objectives	To enable students to understand the types and use of pavement material	
Unit No.		**No. of hours (per Unit)**
Unit: I	**AGGREGATES**	8
Origin, classification, requirements, properties and tests on road aggregates, concepts of size and gradation – design gradation, maximum aggregate size, aggregate blending by different methods to meet specification.		
Unit II	**BITUMEN AND TAR**	7
Origin, preparation, properties and chemical constitution of bituminous road binders; requirement Preparation, characteristics, uses and tests. Adhesion of Bituminous Binders to Road Aggregates: Adhesion failure, mechanism of stripping, tests and methods of improving adhesion.		
Unit III	**BITUMINOUS MIXES**	7
Mechanical properties, dense and open textured mixes, flexibility and brittleness, (no HveemStabilometer&Hubbar – Field-tests) bituminous mix, design methods using Rothfuch's Method only and specification, Marshal mixed design criteria- voids in mineral aggregates, voids in total mix, density, flow, stability, percentage voids filled with bitumen.		
Unit IV	**EQUIPMENT IN HIGHWAY CONSTRUCTION**	7
Various types of equipment for excavation, grading and compaction – their working principle, advantages and limitations. Special equipment for bituminous and cement concrete pavement and stabilized soil road construction.		
Unit V	**CEMENT CONCRETE PAVEMENTS**	7
Specifications and method of cement concrete pavement construction (PQC Importance of providing DLCas sub-base and polythene thin layer between PQC and sub-base); Quality control tests; Construction of various types of joints.		
Text Books	Highway Engineering- Khanna, S.K., and Justo, C.E.G.: Nem Chand and Bros. Roorkee.	
Reference Books	1.Construction Equipment and its Management- Sharma, S.C.:Khanna Publishers. 2.Hot Mix Asphalt Materials, Mixture Design and Construction- Freddy L. Roberts, Kandhal, P.S: University of Texas Austin, Texas. NAPA Education Foundation Lanham, Maryland.	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by the Academic Council	20/10/2022	

Course Outcome for CE3816

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Student should be able to understand the properties of aggregates	2	Em
CO2	Student should be able to analyze the different between bitumen and tar	2	S
CO3	Student should be able to design the bituminous mixes	2	S
CO4	Student should be able to understand the use of equipment in highway construction	2	En
CO5	Student should be able to understand the concept of cement concrete pavements	2	S

CO-PO Mapping for CE3816

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	1	3	3	1	3	3	3	1	2	3	1	2	1
CO 2	1	2	3	2	3	2	2	2	2	3	3	3	1	2
CO 3	2	3	2	3	3	2	3	3	1	1	3	1	1	1
CO 4	3	2	1	1	1	1	1	3	2	2	3	1	2	1
CO 5	3	1	3	3	3	3	1	1	1	1	2	2	1	3
Avg.	2.4	1.8	2.4	2.4	2.2	2.2	2	2.4	1.4	1.8	2.8	1.6	1.4	1.6

CE3817	Title:Pavement Design	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To give knowledge on various types of forces acting on a pavement and basic knowledge of the Road construction.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit: I	Introduction	8
Pavement distresses Distresses in flexible/rigid pavements causes and remedies. Visual Surface distress survey procedures and techniques. Serviceability Indicators for roads. Measurement of Serviceability Indicators using various equipment's like Bump Indicator, Skid tester, Distress surveys & Benkelman Beam. Functional evaluation of pavements Serviceability Concepts, Visual Rating, Pavement Serviceability Index, Roughness Measurements, Skid Resistance, Roughness, and Safety Aspects. Inventory System		
Unit II	Pavement material	7
Maintenance operations/alternatives- Classification of maintenance operations, Routine, Periodic, Special. Common types of maintenance: Potholes, Cracked surface, Ruts & undulations, Resurfacing, Interface treatments, Bituminous Thin Surface Courses- Seal. Coat, Surface Dressing, Premixed carpet, Mixed seal surfacing, Micro asphalt concrete (MAC), Bituminous Surface Courses: Semi-Dense Bituminous Concrete, Bituminous Concrete, and Bitumen Mastic. Road maintenance in high rainfall areas. Choice of materials. Modified bitumen & geo-fabrics. Maintenance alternatives including recycling.		
Unit III	Maintenance of pavement	7
Pavement Management/ Maintenance Management System-Components of PMS and their Activities, Major Steps in Implementing PMS, Inputs, Design, Construction and Maintenance, Rehabilitation and Feedback Systems, Examples of HDM package, Highway Financing, Fund Generation, Evaluating Alternate Strategies and Decision Criteria.		
Unit IV	Different model of Traffic study	7
Prediction Deterioration Models- Factors that affect performance, Types of prediction models, Prediction deterioration model development, Method to assess the precision and accuracy of the developed model.		
Unit V	Pavement management system	7
Pavement Structural Design and Economic Analysis; Emerging Technology in Pavement Management Systems		
Text Books	Traffic engineering and transport planning by L.R. Kadiyali, Khanna Publishers Delhi	
Reference Books	Fair and Williams, Economics of Transportation, Harper & Bros., Publishers, NY, 1959. Winfrey, Robley, Economic Analysis for Highway ,International Textbook Co., PA,USA, 1969	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by the Academic	20/10/2022	

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Course Outcome for CE3817

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Student should be able to understand the basic history of pavement.	2	Em
CO2	Student should be able to understand the materials used in construction of pavement	2	S
CO3	Student should be able to understand the Maintenance of pavement	2	S
CO4	Student should be able to design the Different models of Traffic	3	En
CO5	Student should be able to understand the Pavement management system	2	S

CO-PO Mapping for CE3817

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	1	2	1	1	1	1	2	3	3	3	3	3	3
CO 2	2	1	2	1	1	3	2	3	1	2	3	3	2	1
CO 3	1	1	3	3	2	2	3	2	2	2	2	3	3	3
CO 4	3	1	3	2	3	2	2	2	3	2	2	1	3	2
CO 5	3	1	1	1	2	1	2	3	3	1	1	3	3	1
Avg.	2.4	1	2.2	1.6	1.8	1.8	2	2.4	2.4	2	2.2	2.6	2.8	2

CE3818	Title: Urban transportation planning	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To enable students to understand the Design, conduct and administer surveys to provide the data required for transportation planning.	
Unit No.		No. of hours (per Unit)
Unit: I	Urban Transportation planning	8
Urban Transportation Planning Process & Concepts: Role of transportation – Transportation problems – Urban travel characteristics – Evolution of transportation planning process – Concept of travel demand – Demand function – Independent variables – Travel attributes – Assumptions in demand estimation – Sequential, recursive and simultaneous processes.		
Unit II	Transportation Survey	7
Transportation Survey and Analysis: Definition of study area – Zoning – Types and sources of data – Road side interviews – Home interview surveys – Expansion factors – Accuracy checks. Trip Generation Analysis: Trip generation models – Zonal models – Category analysis – Household models – Trip attractions of work centers. Trip Distribution Analysis: Trip distribution models – Growth factor models – Gravity models – Opportunity models.		
Unit III	Transportation models	7
Mode Split Analysis: Mode choice behavior, Completing modes, Mode split curves, Probabilistic models. Route Split Analysis – Elements of transportation networks, coding – minimum path trees, all-or-nothing assignment		
Unit IV	Data Collection And Inventories	7
Collection of data – Organization of surveys and Analysis, Study Area, Zoning, Types and Sources of Data, Road Side Interviews, Home Interview Surveys, Commercial Vehicle Surveys, Sampling Techniques, Expansion Factors, Accuracy Checks, Use of Secondary Sources, Economic data – Income – Population – Employment – Vehicle Owner Ship.		
Unit V	Traffic Assignment	7
Diversion Curves; Basic Elements of Transport Networks, Coding, Route Properties, Path Building Criteria, Skimming Tree, All-or-Nothing Assignment, Capacity Restraint Techniques, Reallocation of Assigned Volumes, Equilibrium Assignment. Introduction to land use planning models, land use and transportation interaction.		
Text Books	Papacostas, 'Fundamentals of Transportation Planning', Tata McGraw Hill.	
Reference Books	1. Kadiyali.L.R., 'Traffic Engineering and Transportation Planning', Khanna Publishers, New Delhi. 2. Hutchinson, B.G, 'Introduction to Urban System Planning', McGraw Hill.	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	28-05-2022	

Date of approval by the Academic Council	20/10/2022

Course Outcome for CE3818

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Student should be able to understand basics of Urban Transportation planning	2	Em
CO2	Student should be able to analyze the Transportation survey	3	S
CO3	Student should be able to understand the Transportation models	2	S
CO4	Student should be able to analyze the Data collection and inventories	3	En
CO5	Student should be able to understand the concept of Traffic assignment	2	S

CO-PO Mapping for CE3818

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	1	3	3	1	3	3	3	1	2	3	1	2	1
CO 2	1	2	3	2	3	2	2	2	2	3	3	3	1	2
CO 3	2	3	2	3	3	2	3	3	1	1	3	1	1	1
CO 4	3	2	1	1	1	1	1	3	2	2	3	1	2	1
CO 5	3	1	3	3	3	3	1	1	1	1	2	2	1	3
Avg.	2.4	1.8	2.4	2.4	2.2	2.2	2	2.4	1.4	1.8	2.8	1.6	1.4	1.6

CE3820	Title: Entrepreneurship Management in Civil Engineering	L T P C 3 0 03
Version No.	1.0	
Course Prerequisites		
Objectives	To provide essential knowledge of entrepreneurship and management concepts to imparting the necessary competencies and skills of enterprise set up and its management	
Unit No.	Unit Title	No. of hours (Per Unit)
Unit I	Introduction	06
Concept /Meaning and its need, Qualities and functions of entrepreneur and barriers in entrepreneurship, partnership forms of business organizations, Schemes of assistance agencies at National, State, District level: NSIC, NRDC, DC: MSME, SIDBI, NABARD, etc., Introduction to Market Survey and Opportunity Identification		
Unit II	Project Report Preparation	06
Preliminary project report, Detailed project report including technical, economic and market feasibility, Common errors in project report preparations, Exercises on preparation of project report		
Unit III	Introduction to Management	06
Definitions and importance of management, Functions of management: Importance and Process of planning, organizing, staffing, directing and controlling, Principles of management, Concept and structure of an organization, Types of industrial organizations		
Unit IV	Leadership & Motivation	06
Definition, need, qualities and functions of a leader, Manager Vs leader, Types of leadership, Definitions and characteristics, Factors affecting motivation, Theories of motivation (Maslow, Herzberg, McGregor)		
Unit V	Management Scope in Different Areas	06
Introduction, objectives, function, types and importance- (Human Resources Management, Material & store Management, Marketing & sales and Financial Management) Introduction to Customer Relationship Management, Total Quality Management		
Text Books	1. A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana)	
Reference Books	1. Entrepreneurship Development published by Tata McGraw Hill Publishing Company Ltd., New Delhi 2. Entrepreneurship Development in India by CB Gupta and P Srinivasan; Sultan Chand and Sons, New Delhi 3. Entrepreneurship Development - Small Business Enterprises by Poornima M Charantimath; Pearson Education, New Delhi	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by the Academic Council	20/10/2022	

Course Outcome for CE3820

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to understand the concepts, needs, functions of entrepreneurship, Schemes of assistance agencies at National, State, District level: NSIC, NRDC, DC: MSME, SIDBI, NABARD.	2	Em
CO2	Students should be able to understand the concepts of planning & organizing the staff & their controlling.	2	S
CO3	Students should be able to understand the concepts of project reports, Common errors in project report preparations, Exercises on preparation of project report.	2	S
CO4	Students should be able to understand the concepts, need, qualities & functions of a leader, Manager Vs leader, Types of leadership, definitions and characteristics, Factors affecting motivation, Theories of motivation	2	En
CO5	Students should be able to understand the concepts of Human Resource Management & their functions & needs.	2	S

CO-PO Mapping for CE3820

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	1	2	1	1	1	1	2	3	3	3	3	3	3
CO 2	2	1	2	1	1	3	2	3	1	2	3	3	2	1
CO 3	1	1	3	3	2	2	3	2	2	2	2	3	3	3
CO 4	3	1	3	2	3	2	2	2	3	2	2	1	3	2
CO 5	3	1	1	1	2	1	2	3	3	1	1	3	3	1
Avg.	2.4	1	2.2	1.6	1.8	1.8	2	2.4	2.4	2	2.2	2.6	2.8	2

CE3821	Title:Low Cost Housing	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To make the students aware of those factors that affect the cost of construction work and to analyze the influences that effect change in these factors.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit: I	Housing Scenario	8
Status of urban housing- Status of Rural Housing Housing Finance: Introducing- Existing finance system in India- Government role as facilitator Status at Rural Housing Finance- Impenitently in housing finance and related issues		
Unit II	Land Use and Physical Planning for Housing	7
Planning of urban land- Urban land ceiling and regulation act- Effectincey of building bye laws - Residential Densities Housing the Urban Poor: Living conditions in slums- Approaches and strategies for housing urban poor		
Unit III	Development and Adopt On Of Low Cost Housing Technology	7
Adoption of innovative cost effective construction techniques- Adoption of precast elements impartial prefabrication- Adopting of total prefabrication of mass housing in India- General remarks on pre-cast rooting/flooring systems- Economical wall system- Single Brick thick loading bearing wall- 19cm thick load bearing masonry walls- Half brick thick load bearing		
Unit IV	Low Cost Infrastructure Services	7
Present status- Technological options- Low cost sanitation's- Domestic wall- Water supplyenergyRural Housing: Introduction- traditional practice of rural housing continuous- Mud Housing technology- Mud roofs- Characteristics of mud- Fire resistant treatment for thatched roof- Soil stabilization- Rural Housing programs		
Unit V	Housing in Disaster Prone Areas	7
Earthquake- Damages to houses- Traditional Houses in disaster prone areas Type of Damages and Railways of non-engineered buildings- Repair and restore action of earthquake Damaged on-engineered buildings recommendations for future constructions- Requirements of structural safety of thin precast roofing units against - Earthquake forces- Status of R&D in earthquake strengthening measures- Floods- cyclone- future safety		
Text Books	1. Building materials for low –income houses – International council for building research studies and documentation. 2. Hand book of low cost housing - by A. K. Lal – Newage international publishers.	
Reference Books	1. Light weight concrete- Academic Kiado- Rudhai. G – Publishing home of Hungarian Academy of Sciences 1963	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of	28-05-2022	

Studies on	
Date of approval by the Academic Council	20/10/2022

Course Outcome for CE3822

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Student should be able to understand the concept of housing scenario.	2	Em
CO2	Student should be able to understand the basic knowledge of land use and physical planning for housing.	2	S
CO3	Student should be able to understand the concept of Development and Adopt On Of Low Cost Housing Technology	2	S
CO4	Student should be able to understand the concept of Low Cost Infrastructure Services	2	En
CO5	Student should be able to understand the concept of Housing in Disaster Prone Areas	2	s

CO-PO Mapping for CE3822

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	1	2	1	1	1	1	2	3	3	3	3	3	3
CO 2	2	1	2	1	1	3	2	3	1	2	3	3	2	1
CO 3	1	1	3	3	2	2	3	2	2	2	2	3	3	3
CO 4	3	1	3	2	3	2	2	2	3	2	2	1	3	2
CO 5	3	1	1	1	2	1	2	3	3	1	1	3	3	1
Avg.	2.4	1	2.2	1.6	1.8	1.8	2	2.4	2.4	2	2.2	2.6	2.8	2

CE3822	Title:**Airport & Harbor Planning**	**L T P C** **3 0 0 3**
Version No.	**1.0**	
Course Prerequisites	**Nil**	
Objectives	To have an overall knowledge of the design and construction of airport, docks, harbors and ports as a whole.	
Unit No.	**Unit Title**	**No. of hours (per Unit)**
Unit: I	**Introduction**	8
History ,National airport authority, Air craft's and its characteristics, Airport classifications		
Unit II	**Air Port Planning**	7
Objective, FAA recommendation for master plan, Regional planning, Data required before site selection, Airport site selection, Surveys for site selection, Estimation of future air traffic needs		
Unit III	**Airport Design**	7
Run Way Design: Runway orientation, Wind rose ,Basic runway length, Runway geometric design Taxiway Design: Controlling factors, Geometric design standards, Exit taxiways, Separation clearance, Turnaround or bypass taxiway		
Unit IV	**Harbour Planning**	7
History, Advantages and disadvantages of water transportation, Selection of site and planning of harbours, Ship characteristics, Characteristics of goodharbour, Size of harbour		
Unit V	**Docks and Repair Facilities**	7
Harbor docks, Wet docks, Repair docks, Lift docks, Floating docks, Slipways		
Text Books	1. Alonzo Def. Quinn, Design and Construction of Ports and Marine Structure, McGraw – HillBook Company, New York 2. Ashford N. and Wright P.H., Airport Engineering, John Wiley and Sons, Inc., New York.	
Reference Books	1. Horonjeff R and Mackelvey F.X., Planning and Design of Airports fourth Intl.edition,McGrawHill Book Co., New Delhi	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	28-05-2022	
Date of approval by the Academic Council	20/10/2022	

Course Outcome for CE3822

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Student should be able to understand the basic knowledge about Airport.	2	Em
CO2	Student should be able to understand about the airport planning's.	2	S
CO3	Student should be able to design airport.	2	S
CO4	Student should be able to understand about the harbor planning's	2	En
CO5	Student should be able to understand the basic knowledge about docks.	2	s

CO-PO Mapping for CE3822

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	1	2	1	1	1	1	2	3	3	3	3	3	3
CO 2	2	1	2	1	1	3	2	3	1	2	3	3	2	1
CO 3	1	1	3	3	2	2	3	2	2	2	2	3	3	3
CO 4	3	1	3	2	3	2	2	2	3	2	2	1	3	2
CO 5	3	1	1	1	2	1	2	3	3	1	1	3	3	1
Avg.	2.4	1	2.2	1.6	1.8	1.8	2	2.4	2.4	2	2.2	2.6	2.8	2