K.S. Rangasamy College of Technology

(Autonomous)

Curriculum & Syllabus

of

B.E. Civil Engineering

(For the batch admitted in 2020-2021)

R 2018

Accredited by NAAC with 'A^{++}' Grade, Approved by AICTE,
Affiliated to Anna University, Chennai.

KSR Kalvi Nagar, Tiruchengode – 637 215.
Namakkal District, Tamil Nadu, India.

R7/ w.e.f.03.01.2024
Passed in the BOS Meeting Held on 21.11.2023
Approved in Academic Council Meeting held on 23/12/2023

BOS Chairman

CHAIRMAN
Board of Studies
Faculty of Civil Engineering
K.S.Rangasamy College of Technology
TIRUCHENGODE - 637 215

Department of Civil Engineering
K.S.Rangasamy College of Technology (Autonomous)

VISION OF THE DEPARTMENT

To empower the graduates to excel as a competent Professional in the areas of Design and Development of Safe, Healthy, Sustainable and Eco friendly Infrastructure for overall development of the Society.

MISSION OF THE DEPARTMENT

- To provide quality education through interdisciplinary research and innovative practices for the Betterment of human society in teaching and learning.
- To develop creative solutions for a wide range of challenges in Civil Engineering by adopting modern Tools and Techniques.

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B.E – CIVIL ENGINEERING
REGULATIONS – R2018
CHIOCE BASED CREDIT SYSTEM

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1: Our graduates are professionally competent in their chosen career and use appropriate techniques and modern Engineering tools in executing projects.

PEO2: Our graduates apply mathematical, scientific and engineering principles to solve complex problems in Civil Engineering through lifelong learning.

PEO3: Our graduates work in multidisciplinary projects with professional and ethical responsibilities.

PROGRAMME OUTCOMES (POs)

Engineering Graduates will be able to:

PO#	Graduate Attribute	Programme Outcome
1	**Engineering knowledge**	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2	**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.
3	**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.
4	**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.
5	**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.
6	**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.
7	**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.
8	**Ethics**	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9	**Individual and team work**	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
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.
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.
12	**Life-long 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.

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PROGRAMME SPECIFIC OUTCOMES (PSOs):

Engineering Graduates will be able to:

PSO1: The graduates will have the ability to plan, analyse, design, execute cost effective project related to Civil Engineering structures with conservation and protection of natural resources for sustainable growth.

PSO2: The graduates will have the ability to take up employment, new start-ups, entrepreneurship, research and development, chartered Engineering professional to serve the society with honesty and integrity.

MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) WITH PROGRAMMEOUTCOMES (POs)

The B.E. Civil Engineering Programme outcomes leading to the achievement of the objectives are summarized in the following Table.

Programme Educational Objectives	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PEO 1	3	1	3	2	2	1	1	1	2	2	3	1
PEO 2	3	3	3	2	2	1	1	1	2	2	3	1
PEO 3	3	2	3	2	2	1	1	1	3	2	3	1

Contributions: 1- low, 2- medium, 3- high

MAPPING – UG- CIVIL ENGINEERING

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Year	Semester	Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO12	PSO11	PSO12
I	I	Communication Skills I	1	1	1	1	1	2	1	2	3	3	2	3	1	3
		Calculus and Differential Equations	3	3	3	3	2							2	3	
		Applied Chemistry	3	3	3	3	3	3	3	2	2	1	2	3	3	3
		Engineering Drawing	3	3	3	3	3	1		1		3	1	1	3	2
		Basic Electrical Engineering	3	3	2	2	2	1	1	2	1	2	2	3	3	
		Constitution of India								2	2	1		2	1	2
		Chemistry Laboratory	3	3	3	3	3	3	2	3	1		2	1	3	3
		Engineering Practices Laboratory	3	2	2	1	3	2	2	3	1	2	2	1	3	2
I	II	Communication Skills II	1	2	1	2	1	2	1	2	3	3	2	3	1	3
		Laplace Transform and Complex Variables	3	3	2	3	3							2	3	
		Applied Physics For Civil	3	3	2	2	2	2	1	2	1	2	-	-	1	3
		Programming for problem solving	1	3		3	3			2				2	3	3
		Engineering Mechanics	3	2	3	1	1	2		1				3	3	2
		Environmental Science	3	2	3	3	2	3	3	3	3	3	2	2	2	2
		Engineering physics Laboratory	3	3	2	2	2	2	2	1	1	1	1	1	1	3
		Programming for problem solving Laboratory	1	3		3	3			2				2	2	1
II	III	Transform and Partial Differential Equations	3	3	3	2	2						2	2	3	
		Strength of Materials	3	3	1	2	2	2	3	1				2	3	2
		Fluid Mechanics and Hydraulic Machinery	3	3	2	3	2		2	1	1	2	0	1	3	2
		Surveying and Geomatics	2	2	1	3	3	2	1	2	1	2	1	2	2	3
		Construction Materials and Practices	2	2	3	3	2	3	2	3	2	3	1	1	2	2

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		Universal Human Value	3	3	2	2	2	3	3	3	3	3	2	1		
		Surveying Laboratory	2	2	1	3	2	1	1	1	3	1	1	1	2	3
		Hydraulics Engineering Laboratory	2	2	1	3	2	1	1	1	2	1	1	1	3	2
		Career Competency Development I	1	1	1	1	1	2	1	2	3	3	2	3	1	2
II	IV	Structural Analysis	2	3	3	2		1	1	1	2	1		3	3	2
		Soil Mechanics	3	2	1	1	2	1	1	1	1	1	1		3	3
		Water Supply Engineering	3	2	2	1	1	2	1	1	2	1	1		2	3
		Engineering Geology	2	1	2	1	1	2	2	2	1	2		1	2	3
		Concrete Technology	3	2	2	3	2	3	3	3	2	2			3	3
		Start-ups and Entrepreneurship	3	3	3	3	2	1	1	1	1	1	2	3	3	1
		General Elective														
		Building Planning and Drafting Laboratory	1	2	1	2	2	1	1	1	2	1	1	1	2	2
		Materials Testing Laboratory	3	2	3	2	3	2	3	2	2	2	2	1	3	2
		Career Competency Development II	2	2	1	1	1	2	1	1	2	3	2	3	1	2
III	V	Advanced Structural Analysis	2	2	1	2	2	2	3	3				2	1	2
		Fundamentals of Reinforced Concrete Design	3	3	1					3				3	3	2
		Wastewater Engineering	1	1	1	1	2	2	2	2	1	2	1	2	1	3
		Foundation Engineering	2	2	2	1	2	1	1	2	2	1		1	3	2
		Professional Elective- I														
		Open Elective I														
		Environmental Engineering Laboratory	2	2	1	1	2	2	2	1	2	1	1	1	2	2
		Geotechnical Engineering Laboratory	2	2	2	3	2	1	1	1	2	1	1	1	2	
		Career Competency Development III	2	1	2	2	1	1	1	1	2	3	2	3	1	2

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III	VI	Advanced Reinforced Concrete Design	1	2	3					3				3	1	1
		Design of Steel Structures	3	2	2	2	2	3	3	2	3		3	3	2	2
		Hydrology and Water Resources Engineering	3	2	1	1		1	2			1			2	2
		Highway and Railway Engineering	2	1	1	2	1	1	1	2	1	2	1	2	2	3
		Professional Elective- II														
		Open Elective II														
		Computer Aided Analysis and Design Laboratory	3	3	3	3	3	2	1	1	3	2	3	1	3	3
		Irrigation Engineering Design and Drawing Laboratory	3	3	3	3	2	2	2	2	1	2	2	2	3	2
		Career Competency Development IV	2	1	2	2	1	2	1	1	2	3	2	3	1	2
IV	VII	Engineering Economics and Financial Accounting	3	2	3	2	1	3	2	1	2	2	3	1	2	2
		Prestressed Concrete	2	3	3	2	1			1	1	2		2	3	1
		Construction Management	2	1	2	1	2	2	2	2	1	2	1	2	2	1
		Professional Elective- III														
		Professional Elective- IV														
		Open Elective III														
		Research Skill Development I	3	3	2	2	2	2	1	2	1	3	2	1	3	2
		Estimation and Quantity Surveying Laboratory	3	3	2	2	2	2	1	1	1	1	2	1	3	2
		Design Project	1	1	1	3	2	1	1	1	2		2	1	2	3
		Inplant Training	3	1	1	3	1	2	1	2	2	2	3	3	3	3
		Career Competency Development V	2	1	2	2	1	2	1	1	2	3	2	3	1	2
	VIII	Professional Elective - V														
		Research Skill Development II	3	3	3	2	2	2	1	1	1	2	2	1	3	2

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		Project Work	1	1	2	3	2	1	1	1	2		2	1	2	3
Elective	PE I	Remote Sensing and GIS	1	2	3	2	2	1	2		2	2	1		2	3
		Renewable Energy Resources	2	1	1	1	1	3	2	2	1	2	1	2	2	2
		Traffic Engineering and Management	2	1	2	1	2	3	2	2	2	2	1	2	2	
		Green Buildings	2	1	2	2	2	3	3	3	3	2	2	2	2	3
		Smart Materials and Smart Structures	2	3	3	2	3	3	2	3	2	1	1		2	3
	PE II	Municipal Solid Waste management	3	2	1	1	1	3	3	1		1	1		2	2
		Repair and Rehabilitation of Structures	1	0	3	2	0	3	2	1	1	0	1	2	3	2
		Building Services	1	2	2	2	2	1	1	1	2	2	1	1	2	3
		Geo Environmental Engineering	1	2	1	2	2	1	2	1		1			1	2
		Probability and Random Variables	3	3	3	3	2						2	2	3	
	PE III	Prefabricated Structures	3	2	1	1		2	2	2	2	2			2	2
		Ground Improvement Techniques	3	2		1	1	1	2			1			1	2
		Bridge Engineering	3	1	1	1		1	2		3	1			2	1
		Air Pollution Management	3	2	1	1		2	3	1		1			2	2
		Airport, Docks and Harbours			1			2	3	2	1	1	2	1	2	2
	PE IV	Tall Structures	1		1	1	2	1					3	2	2	2
		Quality Control and Assurance	2	1	2	2	2	1	2	1	1	2	1	1	2	2
		Advances in Construction Management	2	2	2	3	2	2	2	2	2	2	2	1	2	2
		Advanced Environmental Engineering	2	2	1	1	2	1	2	1	1	2	2	2	1	3
		Housing Planning and Management	2	1	2	3	2	3	2	3	1	2	2	1	2	2

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	PE V	Project Management	2	1	1	1	1	1	2	2	1	1	1	1	2	1
		Safety in Construction	2		1	1	2		1	1	1		1	2	2	1
		Corrosion Engineering	2	2	3	3	2	3	3	2	2	3	1	1	2	2
		Experimental Stress Analysis	3	2	2	3	3	2	1	1	1	3	2	1	3	2
		Industrial Waste Management	2	2	3	2	1	3	3	1	1	2	1	2	2	2
General Elective	GE	National Cadet Corps (Air Wing)	3	2	1	1	3	3	3	3	3	3	3	3		
		National Cadet Corps (Army Wing)						1		3						
Open Elective	OE	Remote Sensing and GIS Applications	1	2	2	2	2	1	2		3	1	2	1	2	2
		Disaster Management and Mitigation Measures	2	2	3	1	2	3	3	1	2	3	2	1	3	2
		Waste Management techniques	3	2	1	1	1	2	3	1		1	1		2	2
		Climatic Changes and Adaptation Measures	2	1	2		3	2	3		2	2	1	2	3	2
		Structural Health Monitoring	3	2	2	3	3	1	2	1	2	2	2	2	3	2
		Building Management System	2	1	1	2	2	1	1	1	1	1	1	2	2	1
		Building Components	3	2	2	3	2	2	3	2	3	1	2	1	3	2

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SEMESTER I

S.No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
THEORY								
1.	50 EN 001	Communication Skills I	HS	2	1	1	0	2
2.	50 MA 001	Calculus and Differential Equations	BS	4	3	1	0	4
3.	50 CH 001	Applied Chemistry	BS	3	3	0	0	3
4.	50 ME 001	Engineering Drawing	ES	6	2	0	4	4
5.	50 EE 001	Basic Electrical Engineering	ES	3	3	0	0	3
6.	50 MY 001	Constitution of India	MC	2	2	0	0	0
PRACTICALS								
7.	50 CH 0P1	Chemistry Laboratory	BS	4	0	0	4	2
8.	50 ME0P1	Engineering Practices Laboratory	ES	4	0	0	4	2
			Total	**28**	**14**	**02**	**12**	**20**

SEMESTER II

S.No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
THEORY								
1.	50 EN 002	Communication Skills II	HS	2	1	1	0	2
2.	50 MA 002	Laplace Transform and Complex Variables	BS	4	3	1	0	4
3.	50 PH 004	Applied Physics For Civil	BS	3	3	0	0	3
4.	50 CS 001	Programming for problem solving	ES	3	3	0	0	3
5.	50 CE 201	Engineering Mechanics	ES	4	3	1	0	4
6.	50 MY 002	Environmental Science	MC	2	2	0	0	0
PRACTICALS								
7.	50 PH 0P1	Engineering physics Laboratory	BS	4	0	0	4	2
8.	50 CS 0P1	Programming for problem solving Laboratory	ES	4	0	0	4	2
			Total	**26**	**15**	**3**	**8**	**20**

SEMESTER III

S.No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
THEORY								
1.	50 MA 006	Transform and Partial Differential Equations	BS	4	3	1	0	4
2.	50 CE 301	Strength of Materials	PC	4	3	1	0	4
3.	50 CE 302	Fluid Mechanics and Hydraulic Machinery	PC	4	3	1	0	4
4.	50 CE 303	Surveying and Geomatics	PC	3	3	0	0	3
5.	50 CE 304	Construction Materials and Practices	PC	3	3	0	0	3
6.	50 MY 004	Universal Human Value (UHV)*	MC	3	2	1	0	3*
PRACTICALS								
7.	50 CE 3P1	Surveying Laboratory	PC	4	0	0	4	2
8.	50 CE 3P2	Hydraulics Engineering Laboratory	PC	4	0	0	4	2
9.	50 TP 0P1	Career Competency Development I	EEC	2	0	0	2	0
			Total	**31**	**17**	**4**	**10**	**22**

***Universal Human Values (UHV) - Extra credit is offered**

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SEMESTER IV

S.No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
THEORY								
1.	50 CE 401	Structural Analysis	PC	4	3	1	0	4
2.	50 CE 402	Soil Mechanics	PC	4	3	1	0	4
3.	50 CE 403	Water Supply Engineering	PC	3	3	0	0	3
4.	50 CE 404	Engineering Geology	PC	3	3	0	0	2
5.	50 CE 405	Concrete Technology	PC	3	3	0	0	3
6.	50 MY 014	Start-ups and Entrepreneurship	MC	2	2	0	0	0
7.	50 GE 00*	National Cadet Corps (NCC)**	GE	4	2	0	2	3
PRACTICALS								
8.	50 CE 4P1	Building Planning and Drafting Laboratory	PC	4	0	0	4	2
9.	50 CE 4P2	Materials Testing Laboratory	PC	4	0	0	4	2
10.	50 TP 0P2	Career Competency Development II	EEC	2	0	0	2	0
			Total	**33**	**19**	**2**	**12**	**20**

****National Cadet Corps (NCC) is optional, Elective is waived or Extra credit is offered**

SEMESTER V

S.No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
THEORY								
1.	50 CE 501	Advanced Structural Analysis	PC	4	3	1	0	4
2.	50 CE 502	Fundamentals of Reinforced Concrete Design	PC	4	3	1	0	4
3.	50 CE 503	Wastewater Engineering	PC	3	3	0	0	3
4.	51 CE 504	Foundation Engineering	PC	4	3	1	0	4
5.	50 CE E**	Professional Elective- I	PE	3	3	0	0	3
6.	50 CE L**	Open Elective I	OE	3	3	0	0	3
PRACTICALS								
7.	51 CE 5P1	Environmental Engineering Laboratory	PC	4	0	0	4	2
8.	50 CE 5P2	Geotechnical Engineering Laboratory	PC	4	0	0	4	2
9.	50 TP 0P3	Career Competency Development III	EEC	2	0	0	2	0
			Total	**31**	**18**	**3**	**10**	**25**

SEMESTER VI

S.No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
THEORY								
1.	50 CE 601	Advanced Reinforced Concrete Design	PC	4	3	1	0	4
2.	50 CE 602	Design of Steel Structures	PC	4	3	1	0	4
3.	50 CE 603	Hydrology and Water resources Engineering	PC	3	3	0	0	3
4.	50 CE 604	Highway and Railway Engineering	PC	3	3	0	0	3
5.	50 CE E**	Professional Elective- II	PE	3	3	0	0	3
6.	50 CE L**	Open Elective II	OE	3	3	0	0	3
PRACTICALS								
7.	50 CE 6P1	Computer Aided Analysis and Design Laboratory	PC	4	0	0	4	2
8.	50 CE 6P2	Irrigation Engineering Design and Drawing Laboratory	PC	4	0	0	4	2
9.	50 TP 0P4	Career Competency Development IV	EEC	2	0	0	2	0
			Total	**30**	**16**	**2**	**10**	**24**

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SEMESTER VII

S.No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
THEORY								
1.	50 HS 001	Engineering Economics and Financial Accounting	HS	3	3	0	0	3
2.	50 CE 701	Prestressed Concrete	PC	4	3	1	0	4
3.	51 CE 702	Construction Management	PC	3	3	0	0	3
4.	50 CE E**	Professional Elective- III	PE	3	3	0	0	3
5.	50 CE E**	Professional Elective- IV	PE	3	3	0	0	3
6.	50 CE L**	Open Elective III	OE	3	3	0	0	3
7.	50 AC 001	Research Skill Development I	AC	1	1	0	0	0
PRACTICALS								
8.	51 CE 7P1	Estimation and Quantity Surveying Laboratory	PC	4	1	0	2	2
9.	50 CE 7P2	Design Project	EEC	4	0	0	4	2
10.	50 CE7P3	Inplant Training/ Industrial Internship*	EEC	4	0	0	0	1
11.	50 TP 0P5	Career Competency Development V	EEC	2	0	0	2	0
			Total	**34**	**20**	**1**	**8**	**24**

* Extra credits will be offered as additional credits depending on the duration of the internship

SEMESTER VIII

S.No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
THEORY								
1.	50 CE E**	Professional Elective - V	PE	4	2	0	2	3
2.	50 AC 002	Research Skill Development II	AC	1	1	0	0	0
PRACTICALS								
3.	50 CE 8P1	Project Work	EEC	16	0	0	16	8
			Total	**21**	**3**	**0**	**18**	**11**

TOTAL NUMBER OF CREDITS TO BE EARNED FOR AWARD OF THE DEGREE = 166

Note: HS- Humanities and Social Sciences including Management Courses, BS- Basic Science Courses, ES-Engineering Science Courses, PC-Professional Core Courses, PE-Professional Elective Courses, OE- Open Elective Courses, EEC-Employability Enhancement Courses, MC- Mandatory Courses & AC – Audit Course

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HUMANITIES AND SOCIAL SCIENCES (HS)

S.No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1.	50 EN 001	Communication Skills I	HS	2	1	1	0	2
2.	50 EN 002	Communication Skills II	HS	2	1	1	0	2
3.	50 HS 001	Engineering Economics and Financial Accounting	HS	3	3	0	0	3

BASIC SCIENCE (BS)

S.No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1.	50 MA 001	Calculus and Differential Equations	BS	5	3	2	0	4
2.	50 CH 001	Applied Chemistry	BS	3	3	0	0	3
3.	50 CH 0P1	Chemistry Laboratory	BS	4	0	0	4	2
4.	50 MA 002	Laplace Transforms and Complex Variables	BS	5	3	2	0	4
5.	50 PH 004	Applied Physics For Civil	BS	3	3	0	0	3
6.	50 PH 0P1	Engineering physics Laboratory	BS	4	0	0	4	2
7.	50 MA 006	Transform and Partial Differential Equations	BS	5	3	2	0	4

ENGINEERING SCIENCES (ES)

S.No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1.	50 ME 001	Engineering Drawing	ES	3	2	0	4	4
2.	50 EE 001	Basic Electrical Engineering	ES	3	3	0	0	3
3.	50 ME 0P1	Engineering Practices Laboratory	ES	4	0	0	4	2
4.	50 CS 001	Programming for problem solving	ES	3	3	0	0	3
5.	50 CE 201	Engineering Mechanics	ES	5	3	2	0	4
6.	50 CS 0P1	Programming for problem solving Laboratory	ES	4	0	0	4	2

PROFESSIONAL CORE (PC)

S.No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1.	50 CE 301	Strength of Materials	PC	5	3	2	0	4
2.	50 CE 302	Fluid Mechanics and Hydraulic Machinery	PC	5	3	2	0	4
3.	50 CE 303	Surveying and Geomatics	PC	3	3	0	0	3
4.	50 CE 304	Construction Materials and Practices	PC	3	3	0	0	3
5.	50 CE 3P1	Surveying Laboratory	PC	4	0	0	4	2
6.	50 CE 3P2	Hydraulics Engineering Laboratory	PC	4	0	0	4	2
7.	50 CE 401	Structural Analysis	PC	5	3	2	0	4
8.	50 CE 402	Soil Mechanics	PC	5	3	2	0	4
9.	50 CE 403	Water Supply Engineering	PC	3	3	0	0	3
10.	50 CE 404	Engineering Geology	PC	3	3	0	0	2
11.	50 CE 405	Concrete Technology	PC	3	3	0	0	3
12.	50 CE 4P1	Building Planning and Drafting Laboratory	PC	4	0	0	4	2
13.	50 CE 4P2	Materials Testing Laboratory	PC	4	0	0	4	2

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14.	50 CE 501	Advanced Structural Analysis	PC	5	3	2	0	4
15.	50 CE 502	Fundamentals of Reinforced Concrete Design	PC	5	3	2	0	4
16.	50 CE 503	Wastewater Engineering	PC	3	3	0	0	3
17.	51 CE 504	Foundation Engineering	PC	5	3	2	0	4
18.	51 CE 5P1	Environmental Engineering Laboratory	PC	4	0	0	4	2
19.	50 CE 5P2	Geotechnical Engineering Laboratory	PC	4	0	0	4	2
20.	50 CE 601	Advanced Reinforced Concrete Design	PC	5	3	2	0	4
21.	50 CE 602	Hydrology and Water resources Engineering	PC	3	3	0	0	3
22.	50 CE 603	Highway and Railway Engineering	PC	3	3	0	0	3
23.	50 CE 6P1	Computer Aided Analysis and Design Laboratory	PC	4	0	0	4	2
24.	50 CE 6P2	Irrigation Engineering Design and Drawing Laboratory	PC	4	0	0	4	2
25.	50 CE 701	Prestressed Concrete	PC	5	3	2	0	4
26.	50 CE 702	Design of Steel Structures	PC	5	3	2	0	4
27.	51 CE 703	Construction Management	PC	3	3	0	0	3
28.	51 CE 7P1	Estimation and Quantity Surveying Laboratory	PC	4	1	0	2	2

PROFESSIONAL ELECTIVES (PE)
SEMESTER V, ELECTIVE I

S.No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1.	50 CE E11	Remote Sensing and GIS	PE	3	3	0	0	3
2.	50 CE E12	Renewable Energy Resources	PE	3	3	0	0	3
3.	50 CE E13	Traffic Engineering and Management	PE	3	3	0	0	3
4.	50 CE E14	Green Buildings	PE	3	3	0	0	3
5.	50 CE E15	Smart Materials and Smart Structures	PE	3	3	0	0	3

SEMESTER VI, ELECTIVE II

S.No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1.	50 CE E21	Municipal Solid Waste management	PE	3	3	0	0	3
2.	50 CE E22	Repair and Rehabilitation of Structures	PE	3	3	0	0	3
3.	50 CE E23	Building Services	PE	3	3	0	0	3
4.	51 CE E24	Geo Environmental Engineering	PE	3	3	0	0	3
5.	50 CE E25	Probability and Random Variables	PE	3	3	0	0	3

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SEMESTER VII, ELECTIVE III

S.No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1.	50 CE E31	Prefabricated Structures	PE	3	3	0	0	3
2.	51 CE E32	Ground Improvement Techniques	PE	3	3	0	0	3
3.	50 CE E33	Bridge Engineering	PE	3	3	0	0	3
4.	50 CE E34	Air Pollution Management	PE	3	3	0	0	3
5.	50 CE E35	Airport, Docks and Harbours	PE	3	3	0	0	3

SEMESTER VII, ELECTIVE IV

S.No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1.	50 CE E41	Tall Structures	PE	4	2	0	2	3
2.	50 CE E42	Quality Control and Assurance	PE	4	2	0	2	3
3.	50 CE E43	Advances in Construction Management	PE	4	2	0	2	3
4.	51 CE E44	Advanced Environmental Engineering	PE	4	2	0	2	3
5.	50 CE E45	Housing Planning and Management	PE	4	2	0	2	3

SEMESTER VIII, ELECTIVE V

S.No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1.	50 CE E51	Project Management	PE	3	3	0	0	3
2.	50 CE E52	Safety in Construction	PE	3	3	0	0	3
3.	50 CE E53	Corrosion Engineering	PE	3	3	0	0	3
4.	50 CE E54	Experimental Stress Analysis	PE	3	3	0	0	3
5.	50 CE E55	Industrial Waste Management	PE	3	3	0	0	3

GENERAL ELECTIVE (GE)

S.No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1.	50 GE 001	National Cadet Corps(Air Wing)	GE	4	2	0	2	3
2.	50 GE 002	National Cadet Corps (Army Wing)	GE	4	2	0	2	3

SEMESTER VII & SEMESTER VIII, AUDIT COURSES (AC)

S.No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1.	50 AC 001	Research Skill Development - I	AC	10	1	0	0	0
2.	50 AC 002	Research Skill Development -II	AC	15	1	0	0	0

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OPEN ELECTIVES I / II / III (OE)

S.No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1.	50 CE L01	Remote Sensing and GIS Applications	OE	3	3	0	0	3
2.	50 CE L02	Disaster Management and Mitigation Measures	OE	3	3	0	0	3
3.	50 CE L03	Waste Management techniques	OE	3	3	0	0	3
4.	50 CE L04	Climatic Changes and Adaptation Measures	OE	3	3	0	0	3
5.	50 CE L05	Structural Health Monitoring	OE	3	3	0	0	3
6.	50 CE L06	Building Management System	OE	3	3	0	0	3
7.	50 CE L07	Building components	OE	3	3	0	0	3

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

S.No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1.	50 TP 0P1	Career Competency Development I	EEC	2	2	0	0	-
2.	50 TP 0P2	Career Competency Development II	EEC	2	2	0	0	-
3.	50 TP 0P3	Career Competency Development III	EEC	2	2	0	0	-
4.	50 TP 0P4	Career Competency Development IV	EEC	2	2	0	0	-
5.	50 TP 0P5	Career Competency Development V	EEC	2	2	0	0	-
6.	50 CE 7P3	Inplant Training/Industrial Internship	EEC	4	0	0	0	1
7.	50 CE 7P2	Design Project	EEC	4	0	0	4	2
8.	50 CE 8P1	Project Work	EEC	16	0	0	16	8

SUMMARY

S.No.	Category	Credits Per Semester								Total Credits	Percentage %
		I	II	III	IV	V	VI	VII	VIII		
1.	HS	2	2	-	-	-	-	3	-	**07**	**04.22**
2.	BS	9	9	4	-	-	-	-	-	**22**	**13.25**
3.	ES	9	9	-	-	-	-	-	-	**18**	**10.84**
4.	PC	-	-	18	20	19	18	9	-	**84**	**50.60**
5.	PE	-	-	-	-	3	3	6	3	**15**	**09.04**
6.	OE	-	-	-	-	3	3	3	-	**09**	**05.42**
7.	EEC	-	-	-	-	-	-	3	8	**11**	**06.63**
8.	MC	-	-	3*	-	-	-	-	-	**03***	-
9.	AC	-	-	-	-	-	-	0	0	0	0
10.	GE	-	-	-	3*		-	-	-	**03***	**-**
Total		**20**	**20**	**22**	**20**	**25**	**24**	**24**	**11**	**166**	**100**

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K.S.Rangasamy College of Technology – Autonomous R 2018								
50 EN 001 – Communication Skills I								
Common to all Branches								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
I	1	1	0	30	2	50	50	100

Objective(s)	• To help learners improve their vocabulary and to enable them to use words appropriately in different academic and professional contexts • To help learners develop strategies that could be adopted while reading texts • To help learners acquire the ability to speak effectively in English in real life and career related situations • To equip students with effective speaking and listening skills in English • To facilitate learners to enhance their writing skills with coherence and appropriate format effectively
Course Outcomes	**At the end of the course, the student will be able to** 1. Utilize digital literacy tools to develop listening skills & make use of contextual clues to infer meanings of unfamiliar words 2. Able to select, compile & synthesize information using communication strategies for an effective oral presentation 3. Skim & Scan the textual content & infer meanings of unfamiliar words to develop reading & vocabulary skills 4. Generate ideas from sources to develop coherent content and support with relevant details in writing. 5. Recognize the basic phonetic patterns of language & execute it for competent loud reading

Note: Hours notified against each unit in the syllabus are only indicative but are not decisive. Faculty may decide the number of hours for each unit depending upon the concepts and depth. Questions need not be asked based on the number of hours notified against each unit in the syllabus**.**

Listening

Listening to Short Audios – Watching Short Videos - answering MCQs and Vocabulary Check- Listening to Short Comprehension Passages – Guided Listening – Listening to songs and cognizing the lyrics **[4]**

Speaking

Brainstorming – Group Discussion (unstructured) – Self Introduction - Just a Minute (JaM) - Short Narratives – Cue Cards – Picture Cards – Conversational Practices (Preliminary) **[4]**

Reading

Silent Reading – Scanning and Skimming - Reading short and Medium Passages – Cognition of Theme and Inferential Meaning - Academic and Functional Vocabulary List (350 words) – Word Power Check - Loud Reading – Modulation and Pronunciation Check **[4]**

Writing

Functional Vocabulary and Word Power – Data Interpretation - Paragraph Writing – Letter Writing –Email Writing – Conversational Fill Ups **[3]**

Total Hours: 15 + 15(Tutorial) : 30 hours

Text Books

1.	M.Ashraf Rizvi, 'Effective Technical Communication', 2nd Edition, McGraw Hill Education (India) Private Limited, Chennai, 2018
2.	Norman Lewis, 'Word Power Made Easy - The Complete Handbook for Building a Superior Vocabulary Book', Penguin Random House India, 2020

References Books and Sites:

1.	Paul Emmerson and Nick Hamilton , 'Five Minute Activities for Business English', Cambridge University Press, N.York, 2005
2.	Arthur Brookes and Peter Grundy ,' Beginning to Write: Writing Activities for Elementary and Intermediate Learners', Cambridge University Press, N.York, 2003
3.	Michael McCarthy and Felicity O Dell , 'English Vocabulary in Use: Upper Intermediate', Cambridge University Press, N.York, 2012
4.	https://learningenglish.britishcouncil.org/en/listening

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CO1	1	1		1	1	1	1	2	3	3	2	3	1	2
CO2	1	1		3	2	1		2	3	3	3	3	2	2
CO3	1	2	1	2	1	1	2	1	2	3	2	3	2	2
CO4	1	2	1	1	2	2	1	2	1	3	3	3	1	2
CO5	1	1		1	1	1	1	1	3	3	1	3		1

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K.S.Rangasamy College of Technology – Autonomous								R2018
50 MA 001 - Calculus and Differential Equations								
Common to All Branches								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
I	3	1	0	60	4	50	50	100

Objective (s)

- To familiarize the students with the basic concepts in Cayley - Hamilton theorem and Orthogonal transformation.
- To get exposed to the fundamentals in circle of curvature, evolute and envelope of the curves.
- To acquire skills to understand the concepts involved in Jacobians and maxima and minima.
- To solve various linear differential equations and simultaneous differential equations.
- To learn various techniques and methods in solving definite and indefinite integrals.

Course Outcomes

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

CO1: Apply Cayley - Hamilton theorem and to reduce quadratic form into canonical form
CO2: Compute the equation of the circle of curvature, evolute and envelope of the curves.
CO3: Analyze Jacobian methods and constrained maxima and minima functions.
CO4: Apply various methods in differential equations to solve linear and simultaneous differential equations.
CO5: Evaluate definite and indefinite integrals using different techniques.

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the numbers hours indicated.

Matrices

Characteristic equation – Eigen values and Eigen vectors of a real matrix – Properties of Eigen values and Eigen vectors – Cayley-Hamilton theorem (without proof) – Orthogonal transformation of a symmetric matrix to diagonal form – Reduction of quadratic form to canonical form by orthogonal transformation - Nature of quadratic form**.** **[8]**

Differential Calculus

Curvature – radius of curvature (Cartesian and polar co-ordinates) – Centre of curvature – Circle of curvature – Involute and evolute – envelope. **[9]**

Functions Of Several Variables

Partial differentiation – Homogeneous functions and Euler's theorem – Jacobians – Taylor's series for functions of two variables – Maxima and minima of functions of two variables – Constrained maxima and minima: Lagrange's Method of Undetermined Multipliers**.** **[9]**

Differential Equations

Linear differential equations of second and higher order with constant co-efficient - R.H.S is $e^{\alpha x}$, $\sin\alpha x, \cos\alpha x, x^n\ n>0$, $e^{\alpha x}\sin\beta x$, $e^{\alpha x}\cos\beta x$, $e^{\alpha x}x^n$, $x^n\sin\alpha x$ and $x^n\cos\alpha x$ – Differential equations with variable co-efficients : Cauchy's and Legendre's form of linear equation – Method of variation of parameters – Simultaneous first-order linear equations with constant co-efficients. **[9]**

Integral Calculus

Definite and Indefinite integrals - Substitution rule - Techniques of Integration - Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals. **[10]**

Total Hours: 45 + 15(Tutorial) : 60 hours

Text books:

1. B SGrewal, "Higher Engineering Mathematics", 43rd Edition, Khanna Publishers, Delhi, 2014.
   Web site: https://pvpsitrealm.blogspot.com/2016/09/higher-engineering-mathematics-by-bs.html
2. T Veerarajan., "Engineering Mathematics", for Semesters I and II , Tata McGraw Hill Publishing Co., New Delhi., 2010.

Reference(s):

1. Kreyszig Erwin, "Advanced Engineering Mathematics", 10th Edition, John Wiley and Sons (Asia)Limited, New Delhi, 2016.
2. Dr P N Agrawal and Dr D N Pandey, "Integral Equations, calculus of variations and its applications", NPTEL online video courses.
3. Dr S K Gupta and Dr Sanjeev Kumar, "Matrix Analysis with Applications" and Prof Somnath Roy "Matrix Solvers" , NPTEL online video courses.
4. Dr P Kandasamy, Dr K Thilagavathy and Dr K Gunavathy , "Engineering Mathematics-II", S.Chand& Company Ltd, New Delhi,2011

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CO1	3	3	3	3	3							2	3	
CO2	3	3	2	2	2							2	3	
CO3	3	3	3	2	2							2	3	
CO4	3	3	3	3	2							2	3	
CO5	3	3	3	2	3							2	3	

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K.S.Rangasamy College of Technology – Autonomous								R2018
50 CH 001 - Applied Chemistry								
Common to all branches								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
I	3	0	0	45	3	50	50	100

Objective (s)	• To endow with the periodic properties of elements and molecular orbitals variation of orbitals • To assist the learners to apply the thermodynamic functions to electro chemical reactions and its application • To help the learners to analyze the hardness of water and its removal techniques • To endow with various spectroscopy techniques and its applications • To facilitate the students with the basics of stereochemistry and types of chemical reactions with their mechanism
Course Outcomes	**At the end of the course, the student will be able to:** CO1. Rationalize the periodic properties of elements and molecular orbitals variation of orbitals CO2. Apply the thermodynamic functions to electro chemical reactions and its application CO3. Analyse the cause and effects of hardness of water and its removal techniques CO4. Interpret the various spectroscopy techniques and its applications CO5. Infer the types of stereochemistry and chemical reactions with their mechanism

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the numbers hours indicated.

Periodic properties

Effective nuclear charge - atomic and ionic sizes - ionization energies - electron affinity –electronegativity - polarizability - oxidation states- penetration of orbitals- variations of s, p, d and f orbital energies of atoms - electronic configurations, ionic, dipolar and Vander- waals interactions. Hard Soft Acids and Bases (HSAB).

Molecular orbitals of diatomic molecules - plots of the multicenter orbitals. Equations for atomic and molecular orbitals. Energy level diagrams of diatomics. Pi-molecular orbital of butadiene and benzene. **[9]**

Chemical equilibria and corrosion

Thermodynamic functions - energy - entropy -enthalpy- free energy - Gibbs-Helmholtz equation-Van't Hoff isotherm. Cell potentials -Nernst equation - applications - EMF series-applications - Poteniometric and Conductometric titrations.

Corrosion- types of corrosion- chemical and electrochemical corrosion - mechanism - Factors influencing corrosion - Corrosion control methods (impressed current and sacrificial anode methods) - Corrosion inhibitors. **[9]**

Water chemistry

Sources- Water quality parameters - impurities in water and their effects. Hardness- Estimation of hardness-effect of hard water in various industries-Softening of water- external treatment-zeolite process- ion-exchange process-internal treatment-carbonate, phosphate and calgon conditioning-Desalination-reverse osmosis-electrodialysis. Boiler troubles- methods of prevention. **[9]**

Analytical techniques and applications

Absorption laws-Ultra Violet spectroscopy (UV) -Principle - Instrumentation (Block diagram)- applications. Infra-Red spectroscopy (IR)- Instrumentation (Block diagram) - selection rule- types of fundamental vibrations -applications. Nuclear Magnetic Resonance spectroscopy (NMR) - Principle-selection rule - Instrumentation (Block diagram) - chemical shift -factors influencing the chemical shift -applications. Atomic Absorption Spectroscopy (AAS)-Principle - Instrumentation (Block diagram)- applications. **[9]**

Concepts in Organic chemistry

Structural isomerism- types - Stereoisomerism -geometrical (Maleic and Fumaric acids) - optical isomerism (Lactic and Tartaric acids) - symmetry - chirality-enantiomers- diastereomers - optical activity -absolute configurations.

Introduction to reactions - substitution - addition - oxidation - reduction - cyclization and ring openings - mechanism. **[9]**

Total Hours: 45 hours

Text books:

1. Jain. P.C. and Monica Jain, "Engineering Chemistry", Dhanpatrai publishing co. New Delhi, 17th edition, 2021.
2. Vairam, S. and Suba Ramesh, "Engineering Chemistry", Wiley India Private Limited , 2 nd edition, January 2013

Reference(s):

1. Puri B. R., Sharma L.R., and Pathania M.S., "Principles of Physical Chemistry", Vishal Publishing Company, Delhi, 47th edition2020.
2. Dara. S.S, "A Text Book of Engineering Chemistry", S Chand & co. Ltd., 2014
3. Bahl B.S. and Arun Bahl, "Advanced Organic Chemistry", S.Chand, New Delhi, 2014
4. Sharma BK. Instrumental methods of chemical analysis, Goel Publishing House Meerut, 23rd edition; 2014.

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CO1	3	3	2	2	2	2	2	2		1	1	2	1	1
CO2	3	3	3	2	2	2	3	2	1	1	1	1	2	3
CO3	3	3	3	3	2	3	3	3	3	1	2	3	3	3
CO4	3	3	3	3	3	3	3	1	2	1	2	3	3	3
CO5	3	3	3	3	2	2	2	2	1	1	1	1	1	

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K.S.Rangasamy College of Technology – Autonomous R2018								
50 ME 001 - Engineering Drawing								
Common to Civil, MECH, MCT & Text								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
I	2	0	4	90	4	50	50	100

Objective(s)	• To acquire various concepts like dimensioning, conventions and standards. • To impart the graphic skills and draw orthographic views from pictorial views of solids • To learn the concept of projection of solids. • To draw the section of solids and development of surfaces. • To learn the concept of isometric projection.
Course Outcomes	**At the end of the course, the student will be able to** 1. Use the drafting instruments and construct the conic sections 2. Convert the pictorial views of solids in to orthographic views 3. Draw the projections of regular solids and floor plans 4. Draw the true shape of sections and develop the lateral surfaces of right solids 5. Sketch the three dimensional view of solids for given orthographic views.

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

Introduction to Engineering Drawing and Plane Curves

Use of drawing instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning – Drawing sheet layouts - Title block – Line types – Scales: plain, diagonal and vernier scales. Construction of ellipse, parabola and hyperbola (Eccentricity method) - Construction of rectangular hyperbola - Construction of cycloids, epicycloids and hypocycloids. [7+12]

Orthographic Projection

Introduction to orthographic projections – Planes of projection – Projection of points and lines inclined to both planes – Projection of planes (Inclined to one plane and parallel to other – Inclined to both planes) - Conversions of pictorial views to orthographic views. [6+12]

Projection of Solids and Floor plan

Projections of simple solids: prism, pyramid, cylinder and cone (Axis of solid inclined to both HP and VP) - Floor plans: windows, doors and fixtures such as water closet (WC), bath sink, shower etc. [5+12]

Sections of solids and Development of surfaces

Sections of solids :Prism, Cylinder, Pyramid, Cone – Auxiliary Views - Draw the sectional orthographic views of geometrical solids, objects from industry - Development of surfaces of Right solids – Prism, Pyramid, Cylinder and Cone. [6+12]

Isometric Projection

Principles of isometric projection – Isometric scale – Isometric projections of simple solids: Prism, pyramid, cylinder and cone - Isometric projections of frustum and truncated solids - Combination of two solid objects in simple vertical positions. [6+12]

Total Hours: 90

Text Book(s):

1. Bhatt N.D., “Engineering Drawing”, Charotar Publishing House Pvt. Ltd., 53rd Edition, Gujarat, 2014.
2. Basant Agarwal and C.M.Agarwal., “Engineering Drawing”, McGraw Hill Education, 2013.

Reference(s)

1. Shah M.B., Rana B.C., and V.K.Jadon., “Engineering Drawing”, Pearson Education, 2011.
2. Natarajan K.V., “A Text Book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2014.
3. Venugopal K., “Engineering Graphics”, New Age International (P) Limited, 2014.
4. Dhawan, R.K., “A Text Book of Engineering Drawing” 3rd Revised Edition, S. Chand Publishing, New Delhi, 2012.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	1	1	1		3	2	2	3	2
CO2	3	3	3	3	3	1		1		3	1	1	3	2
CO3	3	3	3	3	3	1		1		3	1	1	3	2
CO4	3	3	3	3	3	1		1		3	1	1	3	2
CO5	3	3	3	3	3	1		1		3	1	1	3	2

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K.S.Rangasamy College of Technology - Autonomous R2018								
50 EE 001 - Basic Electrical Engineering								
Common to all branches								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
I	3	0	0	45	3	50	50	100

Objective(s)	• To familiarize the basic DC and AC networks used in electrical circuits. • To explain the concepts of electrical machines and their characteristics. • To explore the sources of electric power generation and various types of power plant. • To identify the various components of low voltage electrical installation • To describe various energy conservation methods useful in industry and commercial purpose.
Course Outcomes	**At the end of the course, the students will be able to** CO1: Apply the basic laws of electric circuits to calculate the unknown quantities. CO2: Acquire knowledge about the constructional details and principle of operation of DC machines and AC machines CO3: Impart the knowledge of generation of electricity based on conventional and non-conventional energy sources CO4: Recognize the significance of various components of low voltage electrical installations. CO5: Create awareness of energy conservation and electrical safety

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

Prerequisite : Physics

DC and AC Circuits - Electrical circuit elements (R, L and C), Voltage and current sources - Kirchhoff's current and voltage laws - Serial and parallel circuits - Analysis of simple circuits with DC excitation. Representation of sinusoidal waveforms, Peak and RMS values, Phasor representation, Real power, Reactive power, Apparent power, Power factor. Analysis of single phase AC circuits consisting of R, L, C, RL, RC, RLC combinations. [12]

DC&AC Machines - Construction, Types and Operation-Faraday's laws of electromagnetic induction - Transformers: Construction, Working principle, Types, Losses in transformers, Regulation, Efficiency and applications-Simple Problems - Applications

Generation of rotating magnetic fields - Three phase induction motor: Construction, working principle, Characteristics, Starting - Single phase induction motor: Construction, working principle and applications - Synchronous generators: Construction, Working principle and applications. [14]

Electrical Power Generation Systems - Sources of electrical energy: Renewable and non-renewable - Principles and schematic diagram of Hydroelectric power plant, Thermal power plant, Nuclear power plant, Solar PV system and Wind energy conversion systems. [5]

Electrical Installations and House Wiring - Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB - Types of Batteries, Important Characteristics for Batteries - UPS.

Single phase and three phase systems: Three phase balanced circuits, Phase sequence, voltage and current relations in star and delta connections - Basic house wiring tools and components - Domestic wiring: Service mains, meter board, distribution board, energy meter. Different types of wiring: staircase, fluorescent lamp and ceiling fan. [8]

Electrical Energy Conservation & Safety - Elementary calculations for energy consumption - BEE Standards - Electrical energy conservation - Methods. Electric shock, Precautions against shock, Objectives of earthing, Types of earthing - Basic electrical safety measures at home and industry. [6]

Total Hours : 45

Text book(s):

1	D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2017.
2	D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2017.

Reference(s):

1	L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
2	E. Hughes, "Electrical and Electronics Technology", Pearson, 2016.
3	V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 2015.
4	RajendraPrasad "Fundamentals of Electrical Engineering"PHI Learning, 2014

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3	3			2					2	3		3	2
CO2	3	3	1	1			2		2		2	1	3	2
CO3	3	3	2	2			2	2	1			1	3	3
CO4	3	3		2		2					2	2	3	2
CO5	3	3	2	1	2	2			2		2	2	3	2

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K.S.Rangasamy College of Technology – Autonomous								R 2018
50 MY 001 - Constitution of India								
Common to all Branches								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
I	2	0	0	30	-	100	-	100

Objectives	• To know the premises informing the twin themes of liberty and freedom from a civil rights perspective. • To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism. • To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution. • To gain knowledge on bill passing • To acquire knowledge on function of election commission
Course Outcomes	**At the end of the course the students will be able to** 1. Discuss the growth of the demand for civil rights in India for the bulk of fns before the arrival of Gandhi in Indian politics. 2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India. 3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution. 4. Discuss the passage of the Hindu Code Bill of 1956. 5. Explain the functions of Election Commission

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

History of Making of the Indian Constitution: **[5]**

History - Drafting Committee, (Composition& Working)

Philosophy of the Indian Constitution: **[5]**

Preamble - Salient Features

Contours of Constitutional Rights & Duties: **[5]**

Fundamental Rights - Right to Equality - Right to Freedom - Right against Exploitation -Right to Freedom of Religion - Cultural and Educational Rights - Right to Constitutional Remedies - Directive Principles of State Policy - Fundamental Duties.

Organs of Governance: **[5]**

Parliament - Composition - Qualifications and Disqualifications - Powers and Functions Executive - President - Governor - Council of Ministers - Judiciary, Appointment and Transfer of Judges, Qualifications - Powers and Functions.

Local Administration: **[5]**

District's Administration head: Role and Importance, - Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation - Panchayat raj: Introduction, PRI: Zila Pachayat - Elected officials and their roles, CEO Zila Pachayat: Position and role- Block level: Organizational Hierarchy (Different departments) -Village level: Role of Elected and Appointed officials - Importance of grass root democracy.

Election Commission: **[5]**

Election Commission: Role and Functioning- Chief Election Commissioner and Election Commissioners- State Election Commission: Role and Functioning- Institute and Bodies for the welfare of SC/ST/OBC and women.

Total Hours: 30

Text books:

1	The Constitution of India, 1950 (Bare Act), Government Publication
2	S.N, Busi, Ambedkar, B.R.,"Framing of Indian Constitution", 1st Edition, 2015.

Reference(s):

1	Basu, D D., "Introduction to the Constitution of India", Lexis Nexis, 2015.
2	M.P Jain, "Indian Constitution Law", 7th Edition, Lexis Nexis, 2014.
3	S R Bhansali, Textbook on The Constitution of India, Universal Publishers, 2015
4	M P Jain, Outlines of Indian Legal and Constitutional History, Lexisnexis, 2014

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1								2	2	1		2	2	2
CO2								2	2	1		2	2	2
CO3								2	2	1		2	2	2
CO4								2	2	1		2	2	2
CO5								2	2	1		2	2	2

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K. S. Rangasamy College of Technology – Autonomous								R2018
50 CH 0P1 – Chemistry Laboratory								
Common to all branches								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
I	0	0	4	60	2	60	40	100

Objective(s)	• To test the knowledge of theoretical concepts. • To develop the experimental skills of the learners. • To facilitate data interpretation. • To enable the learners to get hands-on experience on the principles discussed in theory sessions. • To expose the learners to various industrial and environmental applications.
Course Outcomes	**At the end of the course, the student will learn about** CO1. Calculate the amount of hardness, alkalinity, chloride ion and dissolved oxygen in water sample CO2. Estimate the amount of barium chloride and mixture of acids by conductometry CO3. Infer the amount of acid by pH metry and ferrous ion by potentiometry CO4 Examine the amount of ferrous ion by spectrophotometry CO5. Determine the percentage of corrosion by weight loss method

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

1. Estimation of hardness of water by EDTA method.
2. Estimation of alkalinity of water sample.
3. Estimation of chloride content in water sample (Argentometric method).
4. Determination of dissolved oxygen in boiler feed water (Winkler's method).
5. Estimation of barium chloride by conductometric precipitation titration.
6. Estimation of mixture of acids by conductometric titration.
7. Estimation of ferrous ion by potentiometric titration.
8. Estimation of HCl, beverages and other biological samples by pH meter.
9. Estimation of iron content by spectrophotometry method.
10. Determination of corrosion rate and inhibitor efficiency by weight loss method.

Total Hours : 60

Text Books:

1	Dr. S.Vairam and Dr. Suba Ramesh, "Engineering Chemistry", Wiley India Private Limited, Delhi, 2nd edition, January 2013.
2	S.S. Dara, "A Text Book on Experiments and Calculations Engineering", S.Chand & Co., Ltd., 2ndedition, 2003

References:

1	Mendham. J, Denney. R.C, Barnes. J.D, and Thomas. N.J.K, "Vogel's Text Book of Quantitative Chemical Analysis", Pearson Education, 6th edition, 2009.
2	O P Vermani ,and A K Narula, "Applied Chemistry : Theory And Practice, New Age International (P) Ltd., Publishers, 2ndedition, January 2020
3	Gary D. Christian, "Analytical Chemistry", John Wiley & Sons, 6th edition, 2007.
4	Chatwal Anand, "Instrumental Methods of Chemical Analysis", Himalaya Publications, 5th Edition,2019.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	3	3	3	2		3	2	3	3
CO2	3	3	3	3	3	3	2	3	1		2	1	2	1
CO3	3	3	3	3	3	3	3	2	3		2	1	3	3
CO4	3	3	3	3	3	3	2	1			2		3	3
CO5	3	3	3	3	3	3	2	1			2	1	3	3

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K. S. Rangasamy College of Technology – Autonomous								R2018
50 ME 0P1 – Engineering Practices Laboratory								
Common to all branches								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
I	0	0	4	60	2	60	40	100

Objective(s)	• To acquire skills in basic engineering practices. • To identify the hand tools and instruments. • To provide hands on experience in Fitting, Carpentry, Sheet metal, Welding and lathe shop. • To provide practical training on house hold wiring and electronic circuits. • To offer real time activity on plumbing connections in domestic applications.
Course Outcomes	**At the end of the course, the student will be able to** 1. Perform facing, plain turning, drilling. 2. Make a model of fitting and carpentry: Square, Dovetail and Cross lap joints. 3. Fabricate the models of sheet metal and welding joints. 4. Construct and demonstrate electrical and electronic wiring circuit. 5. Construct the water pipe line in plumbing shop.

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

Machine shop

Safety aspects in machine shop, Study of Lathe and Radial drilling machine, Turning, Facing and Drilling.

Fitting and Carpentry

Safety aspects in Fitting and Carpentry, Study of tools and equipments, Preparation of models- Square, Dove tail joint, Cross Lap.

Sheet Metal and Welding

Safety aspects in Sheet metal and Welding, Study of tools and equipments, Sheet metal models - Scoope, Cone, Tray, Preparation weld joints -Lap, butt, T-joints. Study of Gas Welding and Equipments.

Electrical Wiring & Electronics

Safety aspects of Electrical wiring, Study of Electrical Materials and wiring components, Wiring circuit for a lamp using single and stair case switches. Wiring circuit for fluorescent lamps, Basic electronic circuit.

Plumbing

Study of plumbing tools, assembly of G.I. pipes/ PVC and pipe fittings, Cutting of threads in G.I.Pipes/PVC by thread cutting dies.

Smithy, Plastic moulding and Glass cutting

Safety aspects in smithy, plastic moulding and glass cutting, Study of tools and equipments.

Lab Manual :

1. “Engineering Practices Lab Manual”, Department of Mechanical Engineering, KSRCT.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	3	2	2	3	1	2	2	1	3	1
CO2	3	2	2	1	3	2	2	3	1	2	2	1	3	1
CO3	3	2	2	1	3	2	2	3	1	2	2	1	3	1
CO4	3	2	2	1	3	2	2	3	1	2	2	1	3	1
CO5	3	2	2	1	3	2	2	3	1	2	2	1	3	1

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K.S.Rangasamy College of Technology – Autonomous R 2018								
50 EN 002 – Communication Skills II								
Common to all Branches								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	1	1	0	30	2	50	50	100

Objective(s)	• To help learners improve their vocabulary and enable them to use words appropriately in different academic and professional contexts. • To help learners develop strategies that could be adopted while reading texts. • To help learners acquire the ability to speak and write effectively in English in real life and career related situations. • Improve listening, observational skills, and problem solving capabilities • Develop message generating and delivery skills
Course Outcomes	**At the end of the course, the student will be able to** 1. Identify speaker's purpose and tone, comprehend relationship between ideas and respond to the listening content 2. Use communication strategies, vocabulary and appropriate grammatical structures for effective oral interactions 3. Make inferences and predictions, develop reading speed, build academic vocabulary by utilizing digital literacy tools on textual comprehension 4. Use a variety of accurate sentence structures with functional vocabulary, apply the conventions of academic writing and use peer and teacher feedback for effective writing. 5. Demonstrate proficiency in communication skills in academic and professional contexts

Note: Hours notified against each unit in the syllabus are only indicative but are not decisive. Faculty may decide the number of hours for each unit depending upon the concepts and depth. Questions need not be asked based on the number of hours notified against each unit in the syllabus**.**

Advanced English Listening Module

Extended Listening to Podcasts – Listen and Watch Video Clips - answering Inferential Multiple Choice Questions and Vocabulary Check- Listening to Lengthy Discourses – Structured Listening – Listening to Songs and Cognizing the Lyrics-Listening to popular speeches, news briefs and stories. [4]

Oral Communication

Debates – Group Discussion (Structured) and rotate roles – Elevator Speech – Prepared Talk – Extempore – Brief Technical presentations- Spin-a-Yarn – Short Film reviews – talk on silent videos – Dialogues and Role plays (Intermediate & Higher Level) – Interviews [4]

Critical Reading Process

Silent Reading – Scanning and Skimming - Reading comprehension with logical reasoning questions – Cognition of Theme and Inferential Meaning – advanced Academic and Functional Vocabulary List (1000 words) – word webs and semantic threads - Loud Reading – Modulation and Pronunciation Check – Mind maps – Note making – Deep Reading Skills [4]

Academic Writing Practices

Sentence Equivalence and Text completion tasks – Data Interpretation - Essay Writing – Letter Writing – Business Emails – Conversational Fill Ups-Rewordify (select a text and simplify/enhance the language)- Reports on events. [3]

Total Hours: 15 + 15(Tutorial) : 30 hours

Text Books:

1. M.Ashraf Rizvi, 'Effective Technical Communication', 2nd Edition, McGraw Hill Education (India) Private Limited, Chennai, 2018
2. Norman Lewis, 'Word Power Made Easy - The Complete Handbook for Building a Superior Vocabulary Book', Penguin Random House India, 2020

References:

1. Baul Emmerson and Nick Hamilton, 'Five Minute Activities for Business English', Cambridge University Press, N.York, 2005
2. Ruth Wainry b, 'Stories: Narrative Activities for The Language Classroom', Cambridge University Press, N.York, 2005
3. Stuart Redman, 'English Vocabulary in Use: Upper Intermediate', Cambridge University Press, N.Y, 2006
4. https://www.khanacademy.org/test-prep/sat/sat-reading-writing-practice

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2		2	1	1	1	2	3	3	2	3	1	1
CO2	1	2	1	3	2	1		2	3	3	2	3	2	2
CO3	1	2	1	2	1	1	2	2	2	3	2	3	2	2
CO4	1	3	1	2	2	2	1	2	2	3	3	3	1	2
CO5	1	1	1	1	1	1	1	1	3	3	2	3	2	3

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K.S.Rangasamy College of Technology – Autonomous								R2018
50 MA 002 - Laplace Transform and Complex Variables								
Common to All Branches								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	3	1	0	60	4	50	50	100

Objective(s)	• To provide exposure and ability in handling situations involving multiple integrals, Beta and Gamma functions. • To familiarize the students with the basic concepts in Vector calculus. • To get exposed to the fundamentals in analytic functions, conformal mappings and Bilinear transformation. • To acquire skills to understand the concepts involved in Cauchy's integral formula, Cauchy's residue theorem and Contour integration. • To understand the concepts in Laplace transform techniques and its properties.
Course Outcomes	**At the end of the course, the students will be able to** CO1: Evaluate double and triple integrals and analyze Beta and Gamma functions. CO2: Analyze the basic concepts of vector calculus to verify Green's, Stoke's and Gauss Divergence theorems. CO3: Construct the analytic functions and Bilinear transformation. CO4: Apply Cauchy's integral formula and Cauchy's residue theorem to evaluate the complex integrals. CO5: Apply Laplace transform techniques for solving differential equations.

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the numbers hours indicated.

Multiple Integrals

Double integration – Cartesian and polar coordinates – Change of order of integration – Area between two curves – Area as double integral – Triple integration in Cartesian coordinates.

Beta and Gamma functions**:** Relationship between Beta and Gamma functions – Properties – Problems**.** **[9]**

Vector Calculus

Introduction - gradient of a scalar point function - directional derivative - angle of intersection of two surfaces – divergence and curl(excluding vector identities) - solenoidal and irrotational vectors - Green's theorem in the plane - Gauss divergence theorem -Stokes' theorem(without proof)- verification of the above theorems and evaluation of integrals using them. **[9]**

Analytic Functions

Analytic functions – Necessary conditions (Cauchy–Riemann equations)- Polar form of Cauchy–Riemann equations – Sufficient conditions (without proof) – Properties of analytic functions – Harmonic function –Harmonic conjugate – Construction of analytic functions– Conformal mapping: w = z + a, az, 1/z -Bilinear transformation. **[9]**

Complex Integration

Cauchy's Integral theorem (without proof) – Cauchy's integral formula – Taylor's and Laurent's series (without proof) – Classification of singularities – Cauchy's residue theorem – Contour integration – Circular and semi-circular contours (excluding poles on real axis)**.** **[8]**

Laplace Transforms

Conditions for existence – Transform of elementary functions – Basic properties – Shifting theorems- Derivatives and integrals of transforms –– Transform of unit step function – Dirac's delta function- Initial and final value theorem– Transform of periodic functions. Inverse Laplace transform – Convolution theorem(excluding proof) – Solution of second order ordinary differential equation with constant co-efficients – simultaneous equations of first order with constant co-efficients. **[10]**

Total Hours: 45 + 15(Tutorial) = 60 hours

Text books:

1	Grewal B.S, "Higher Engineering Mathematics", 43rd Edition, Khanna Publishers, Delhi, 2014. Website: https://pvpsitrealm.blogspot.com/2016/09/higher-engineering-mathematics-by-bs.html
2	Kreyszig Erwin, "Advanced Engineering Mathematics", 10th Edition, John Wiley and Sons (Asia) Limited, New Delhi, 2016.

Reference(s):

1	N P Bali and DrManish Goyal,"A text book of Engineering Mathematics",8thedition,Laxmi Publications (P)LTD,2011
2	T Veerarajan, "Engineering Mathematics", for Semesters I and II, Tata McGraw Hill Publishing Co., New Delhi, 2010.
3	Dr P Kandasamy,Dr K Thilagavathy and Dr K Gunavathy , "Engineering Mathematics -II", S.Chand& Company Ltd, New Delhi,2011.
4	SWAYAM online video courses.(www.swayamprabha.gov.in)

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	3							2	3	
CO2	3	3	2	2	3							2	3	
CO3	3	3	3	2	2							2	3	
CO4	3	3	2	2	3							2	3	
CO5	3	3	2	3	3							2	3	

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K.S.Rangasamy College of Technology - Autonomous					R2018			
50 PH 004 - Applied Physics For Civil								
B.E Civil Engineering								
Semester	**Hours/week**				**Credit**	**Maximum marks**		
	L	**T**	**P**	Total Hours	**C**	**CA**	**ES**	**Total**
II	3	0	0	45	3	50	50	100

Objective(s)	• To explain the principles of laser, types of laser and demonstrate the applications of laser. • To state the principle of optical fiber and to understand the design and applications of optical fibers. • To study the basics of ultrasonic, production of ultrasonic waves and non-destructive techniques. • To provide professionals with in-depth knowledge in the fields of noise and vibration insulation and acoustic conditioning of buildings. • To describe the fundamental concepts of structure-property relationships for advanced ceramics.
Course Outcomes	**At the end of the course, Students will be able to** CO1: Recognize the basic ideas about classification of laser and various applications of laser. CO2: Assess the propagation of light in fiber optic cables, communication link and applications CO3: Interpret the production and detection of ultrasonic waves in various engineering applications. CO4: Analyze the characteristics of sound and suggestions for buildings with good acoustics. CO5: Apply the basic ideas about the ceramic types and structure for potential applications.

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the numbers hours indicated.

LASER TECHNOLOGY

Einstein's theory of matter radiation interaction and A and B coefficients; amplification of light by population inversion-different types of lasers: gas lasers (CO_2), solid-state lasers (Nd: YAG), dye lasers, Semiconductor laser (Homojunction and Hetero junction)-Properties of laser beams-applications of lasers in science and engineering. **[8]**

FIBER OPTICS AND SENSORS

Principles – cone of acceptance, numerical aperture (derivation)- Modes of propagation –Fabrication of optical fibre: Crucible-crucible technique - Classification: based on materials, modes and refractive index profile– Splicing : types of splicing- Losses in optical fiber – Detectors – Fiber optical communication links (Block diagram) – Advantage of fiber optical cable over copper cables- Fiber optic sensors: liquid level sensors, Temperature and Displacement sensors **[9]**

ULTRASONICS AND APPLICATIONS

Introduction-Properties-Production: Magnetostriction effect, Magnetostriction generator- piezoelectric effect, piezoelectric generator – Ultrasonic detection- acoustical grating-Applications: Cavitation, cleaning, SONAR– Nondestructive testing: Pulse echo system, through transmission, resonance system- Medical applications: cardiology, neurology, ultrasonic imaging (A, B and TM- Scan). **[9]**

ACOUSTICS

Introduction-Classification of sound – Characteristics of musical sound – sound intensity level – Weber-Fechner law – loudness level and intensity: Bel, Decibel– basic requirements for acoustically good halls- Reverberation – Reverberation time – Sabine's formula (derivation) – Absorption co-efficient (derivation)–sound absorption co-efficient measuring method-the two microphone method- Factors affecting the acoustics of buildings and their remedies-acoustical materials. **[10]**

ADVANCED CERAMICS

Introduction – Classification of ceramics – Structure of ceramics – Ceramic fabrication – Casting processes – Dry processing – Isotatic pressing – Plastic forming – Densification – Ceramic materials: Piezo, ferromagnetic, ceramic fibres & high alumini – Properties and applications of ceramics. **[9]**

Total Hours: 45

Text Books:

1.	V.Rajendran, "Engineering Physics", Tata McGraw Hill, New Delhi, 2011.
2.	Gaur R K, Gupta S L, "Engineering Physics", Dhanpat Rai Publications, New Delhi, 2006.

Reference (s) :

1	Dattuprasad ,Ramanlal Joshi "Engineering Physics" Tata McGraw Hill education, 2016.
2	P.K.Palanisamy, "Physics of Materials", Scitech Publications,Chennai, 2012.
3	A.K.Bhargava, "Engineering materials: Polymers, Ceramics and Composites", PHI learning Pvt Ltd, 2010.
4	M.N.Avathanalu & P.G.Kshirsagar, "A text book of engineering physics" S.Chand & Co.Ltd, 2005.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	1	2	2	2	2	2	2	-	-	2	1
CO2	3	3	2	2	2	2	-	2	2	2	1	-	1	2
CO3	3	2	2	2	1	1	1	1	2	2	-	-	2	1
CO4	3	2	2	2	3	-	2	2	-	1	-	1	2	-
CO5	3	3	3	2	2	3	1	1	-	1	-	-	2	2

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K.S.Rangasamy College of Technology – Autonomous R2018								
50 CS 001 - Programming for Problem Solving								
Common to all Branches								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	3	0	0	45	3	50	50	100

Objective(s)	• To learn the evolution of computers and examines the most fundamental element of the C language • To examine the execution of branching, looping statements, arrays and strings. • To understand the concept of functions , pointers and the techniques of putting them to use • To apply the knowledge of structures and unions to solve basic problems in C language • To enhance the knowledge in file handling functions for storage and retrieval of data
Course Outcomes	**At the end of the course, the student will be able to:** CO1: Infer the evolution, generation, representation of problem and recognize the concepts of data types and expressions CO2: Annotate the concept of console Input and output features and examine the execution of branching, looping statements, arrays and strings CO3: Recognize the concepts of functions, recursion, storage class specifies and pointers with its features CO4: Comprehend basic concepts of structures ,unions ,user defined data types and preprocessor CO5: Interpret the file concepts using proper standard library functions

Note: Hours notified against each unit in the syllabus are only indicative but are not decisive. Faculty may decide the number of hours for each unit depending upon the concepts and depth. Questions need not be asked based on the number of hours notified against each unit in the syllabus.

Introduction to Computer and Programming

Introduction to Computers - Evolution of computers - Generations of computers and Programming Languages– Introduction to components of a computer system -Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart–Pseudocode with examples. From algorithms to programs– variables (with data types)– Type Qualifiers - Constants – Operators –expressions and precedence [9]

Suggested Activities:

Knowing the history of computers

Developing Pseudocodes and flowcharts for real life activities

Developing algorithms for basic mathematical expressions using arithmetic operations.

Suggested Evaluation Methods:

Group Discussion on Introduction to Computers and its generation

Assignments on pseudocodes and flowcharts

I/O ,Branching ,Loops and Arrays

Console I/O– Unformatted and Formatted Console I/O – Conditional Branching and Loops -Writing and evaluation of conditionals and consequent branching -Iteration and loops - Arrays (1-D, 2-D), Character arrays and Strings [9]

Suggested Activities:

Simple programs using I/O statements, arithmetic operations

Implementation of simple programs using **Branching ,Loops and Arrays**

Performing String operations

Suggested Evaluation Methods:

Tutorial for the above activities

Group discussion on role of Branching, loop and Arrays in Programming Language

Functions and Pointers

Functions: Scope of a Function – Library Functions and User defined functions - Function Prototypes – Function Categorization - Function Arguments - Arguments to main function - The return Statement - Recursion - Passing Arrays to Functions– Storage class Specifiers.Introduction to Pointer Variables - The Pointer Operators - Pointer Expressions - Pointers and Arrays - Generating a Pointer to an Array - Indexing Pointers– Dynamic memory allocation [9]

Suggested Activities:

Develop simple applications like Calculator, Various Conversion Process using functions

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Develop a simple programs by applying pointer cobcepts

Suggested Evaluation Methods:

Tutorial for the above activities

Group discussion on Function and Pointers

Structures, Unions, Enumerations, Typedef and Preprocessors

Structures - Arrays of Structures- Arrays and Structures within Structures - Passing Structures to Functions - Structure Pointers - Unions – BitFields - Enumerations - typedef – The preprocessor and comments. [9]

Suggested Activities:

Develop simple programs using **Structures, Unions, Enumerations, Typedef and Preprocessors**

Suggested Evaluation Methods:

Tutorial for the above activities

File

File: Streams –Reading and Writing Characters - Reading and Writing Strings -,File System functions - Random Access Files [9]

Suggested Activities:

Develop simple applications to apply files operations

Suggested Evaluation Methods:

Tutorial for the above activities

Group discussion on Files Concepts

Text book:

1	Herbert Schildt, “The Complete Reference C”, Fourth Edition, Tata McGraw Hill Edition, 2010.
2	Byron Gottfried, “Programming with C”, Third Edition, McGraw Hill Education, 2014.

Reference(s):

1	E.Balagurusamy, “Programming in ANSI C”, Seventh Edition, Tata McGraw Hill Edition, New Delhi, 2016.
2	Brian W. Kernighan and Dennis M. Ritchie, “C Programming Language”, Prentice-Hall.
3	Reema Thareja, “Computer Fundamentals and Programming in C”, Second Edition, Oxford Higher Education, 2016.
4	K N King, “C Programming: A Modern Approach”, Second Edition, W.W.Norton, New York, 2008.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	3		2	2							1		
CO2	1	3		3	3			2				2	3	3
CO3	1	3		2	3			2				2	2	2
CO4	1	3		3	3			2				2	3	3
CO5	1	3		2	3			2				2	3	2

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K.S.Rangasamy College of Technology – Autonomous								R 2018
50 CE 201 - Engineering Mechanics								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	3	1	0	60	4	50	50	100

Objective(s)	• To understand static equilibrium of particles and rigid bodies in two dimensions. • To comprehend the effect of friction on equilibrium. • To understand the laws of motion, the kinematics of motion and the interrelationship. • To identify the different types of beams subjected to simple loading. • To write the dynamic equilibrium equation and all these should be achieved both conceptually and through solved examples.
Course Outcomes	**At the end of the course, the student will be able to** CO1: Recall the fundamental knowledge on laws of mechanics and Computation of equilibrium of forces to know the different types of support and reactions CO2: Explain the concepts of different types of static frictions and Analyse the truss member by different methods CO3: Compute the centroid and second moment of area for various sections. CO4: Examine the different types of motion in dynamics of particles CO5: Identify the various types of statically determinate beams and Compute the shear force and bending moment

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

Statics and Equilibrium of Rigid Bodies

Introduction to statics- Parallelogram laws of forces – Concurrent Forces and Non concurrent forces- Parallel Forces - Equilibrium of particles – Free body diagram- Types of Supports and Reactions - Simple problems in reactions – Moments and Couples – Moment of Forces about a point and about an axis. **[9]**

Frictions and Application of Statics

Friction – Frictional forces – Laws of coulomb's friction – Simple contact friction- Ladder friction – Belt friction – Rolling resistance – Trusses - Analysis of Truss – Method of joints and Method of Section. **[9]**

Properties of Surfaces and Solids

Determination of Areas and Volumes- Pappus Guldinus Theorem – Radius of gyration - First moment of area and the Centroid of sections – Rectangle, circle, triangle from integration – T section, I section, Angle section, Hollow section – Second and product moments of plane area – Rectangle, triangle, circle from integration – T section, I section, Angle section, Hollow section – Parallel axis theorem and perpendicular axis theorem – Polar moment of inertia. **[10]**

Dynamics of Particles

Kinematics: Displacement, Velocity and acceleration, their relationship – Relative motion – Rectilinear motion -–Projectile motion. Kinetics: Newton's law – D' Alembert's Principle - Principles of Work Energy Equation of particles – Impulse and momentum – Impact of elastic bodies **[8]**

Beams

Beams – Types of beams - Statically determinate beams subjected to simple loading – Shear force and Bending Moment – Shear Force Diagram and Bending Moment Diagram –Point of contra flexure - Relationship between load, shear force and bending moment. **[9]**

Total Hours: 45 + 15(Tutorial) = 60 hours

Text book(s):

1.	N.H.Dubey., "Engineering Mechanics - Statics and Dynamics", Tata Mc Graw Hill Private Ltd., New Delhi, 2013.
2.	Palanisamy, M.S. and Nagan, S., " Engineering Mechanics- Statics and Dynamics", Tata Mc Graw Hill Private Ltd., New Delhi, 2008.

Reference(s):

1.	Bansal, R.K., "Engineering Mechanics", Laxmi Publications Private Ltd, New Delhi, 2017.
2.	Beer, F.P and Johnson Jr. E.R., "Vector Mechanics for Engineers - Statics and Dynamics", McGraw-Hill International Edition, 2009.
3.	Hibbeller, R.C., "Engineering Mechanics", Vol. 1 Statics, Vol. 2 Dynamics, Pearson Education Asia Pvt. Ltd., 2000.
4.	Irving H. Shames., "Engineering Mechanics – Statics and Dynamics", IV Edition – Pearson Education Asia Pvt. Ltd., 2003.

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CO1	3	2	2	1	1	2		1				3	3	2
CO2	3	2	3	1	1	2		1				3	3	2
CO3	3	2	2	1	1	1		1				3	3	2
CO4	3	2	3	1	1	1		1				3	3	2
CO5	3	2	3	1	1	2		2				3	3	2

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K.S.Rangasamy College of Technology – Autonomous								R2018
50 MY 002 – Environmental Science								
Common to all Branches								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	2	0	0	30	0	100	-	100

Objectives	• To help the learners to analyze the importance of ecosystem and biodiversity. • To familiarize the learners with the impacts of pollution and control. • To enlighten the learners about waste and disaster management. • To endow with an overview of food resources and human health. • To enlighten awareness and recognize the social responsibility in environmental issues.
Course Outcomes	**At the end of the course, the student will be able to** CO1. Recognize the concepts and importance of environment, ecosystem and biodiversity. CO2. Analyze the source, effects, and control measures of pollution. CO3. Enlighten of solid waste and disaster management. CO4. Alertness about food resources, population and health issues. CO5. Analyze the social issues and civic responsibilities

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

ENVIRONMENTAL STUDIES, ECOSYSTEM AND BIODIVERSITY

Environmental studies - Scope and multidisciplinary nature - Need for public awareness - Ecosystem - Structure and function. Biodiversity - Values of biodiversity - Endangered and endemic species - Hot spots - India a mega biodiversity nation - Threats - Conservation - In-situ and ex-situ - Case studies. **[6]**

ENVIRONMENTAL POLLUTION

Pollution - Air, water, soil, noise and nuclear - sources, effects and control measures - Impacts of mining - Environment protection act- Case studies. **[6]**

WASTE AND DISASTER MANAGEMENT

Waste - Solid waste - e-waste - sources, effects and control measures. Disaster management - Earth quakes - Landslides - Floods - Cyclones - Tsunami - Disaster preparedness - Case studies. **[5]**

FOOD RESOURCES, HUMAN POPULATION AND HEALTH

World food problems - over grazing and desertification - effects of modern agriculture. Population - Population explosion and its impacts - HIV/AIDS - Cancer- Role of IT in environment and human health - Case studies. **[6]**

SOCIAL ISSUES AND THE ENVIRONMENT

Unsustainable to sustainable development - Use of alternate energy sources - Rain water harvesting - Water shed management - Deforestation - Greenhouse effect - Global warming - Climate change - Acid rain - Ozone layer depletion - Waste land reclamation. Consumerism and waste products - Role of an individual in conservation of natural resources - Case studies. **[7]**

Total Hours: 30

Text books:

1	Anubha Kaushik and C P Kaushik, “Perspectives in Environmental Studies”, New Age International Publishers, New Delhi, 6th edition, January 2018.
2	Tyler Miller. G, “Environmental Science”, Cengage Publications, Delhi, 16th edition, 2018.

Reference(s):

1	Gilbert M.Masters and Wendell P. Ela, “Environmental Engineering And Science”, PHI Learning Private Limited, New Delhi, 3rd Edition, 2013.
2	Rajagopalan. R, “Environmental Studies” Oxford University Press, New Delhi, 3rd Edition, 2016..
3	Deeksha Dave and Katewa. S.S, “Environmental Studies”, Cengage Publications, Delhi, , 2nd edition , 2013.
4	Cunningham, W.P. and Saigo, B.W. Environment Science, Mcgraw-Hill, USA. 9th edition, 2007.

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CO1	2	1	2	1	1	2	3	3	3	3		2	2	2
CO2	3	3	3	3	2	3	3	3	3	3	2	2	3	3
CO3	3	3	3	3	2	3	3	3	3	3	2	2	3	3
CO4	2	2	2	3	3	3	3	3	2	2	3	2	1	1
CO5	3	3	3	3	3	3	3	3	3	3	3	2	3	3

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K.S.Rangasamy College of Technology-Autonomous R2018								
50 PH 0P1 - Engineering Physics Laboratory								
Common to - MECH, MCT, TXT, FT, BT, NST, CIVIL								
Semester	**Hours/week**			Total Hours	**Credit**	**Maximum marks**		
	L	**T**	**P**		**C**	**CA**	**ES**	**Total**
II	0	0	4	60	2	60	40	100

Objective(s)	• To infer the practical knowledge by applying the experimental methods to correlate with the Physics theory. • To demonstrate an ability to make physical measurements and understand the limits of precision in measurements • To introduce different experiments to test basic understanding of physics concepts applied in optics and electronics. • To enable the students to correlate the theoretical principles with application oriented studies. • To analyze the behavior and characteristics of various materials for its optimumutilization
Course Outcomes	**At the end of the course, Students will able to** 1. Apply the concept of stress, strain and elastic limit for a given sample to find their properties.(1-3) 2. Recognize the viscosity and surface tension properties of liquids for its various applications.(4-6) 3. Recall the knowledge of properties of light through spectrometer grating and fiber optic cable (7-8) 4. Assess the dielectric behavior of a given material.(9) 5. Interpret the photovoltaic effect to demonstrate the working of solar cell.(10)

LIST OF EXPERIMENTS

1. Determination of Young's modulus of a steel bar by uniform bending method.
2. Determination of Young's modulus of a cantilever (Pin & Microscope method).
3. Determination of rigidity modulus of a wire by torsional pendulum.
4. Comparison of co-efficient of viscosity of two different liquids by Poiseuille's method.
5. Co-efficient of viscosity of highly viscous liquids.
6. Comparison of surface tension of two different liquids by capillary rise method.
7. Determination of NA, acceptance angle, and wave length of a given laser by using optical fiber.
8. Determination of wavelength of mercury spectral lines – spectrometer grating.
9. Determination of dielectric constant.
10. V-I characteristics of solar cell.

Total Hours : 60

Lab Manual:

1. "Physics Lab Manual", Department of Physics , KSRCT

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CO1	3	3	2	2	2	2	2	2	2	2	-	2	2	2
CO2	3	3	3	2	2	-	2	2	2	1	1	2	2	1
CO3	3	2	3	2	2	1	2	1	-	2	2	-	2	2
CO4	3	3	3	1	3	2	2	2	1	1	-	1	1	-
CO5	3	3	3	2	2	3	-	1	1	1	2	-	2	1

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K.S.Rangasamy College of Technology - Autonomous								R2018
50 CS 0P1 - Programming for Problem Solving Laboratory								
Common to all Branches								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	0	0	4	60	2	60	40	100

Objective(s)	• To enable the students to apply the concepts of C to solve simple problems • To use selection and iterative statements in C programs • To apply the knowledge of library functions in C programming • To implement the concepts of arrays, functions, structures and pointers in C • To implement the file handling operations through C
Course Outcomes	**At the end of the course the students will be able to** CO1: Apply how to read, display basic information and use selection and iterative statements CO2: Demonstrate C program to manage collection of related data CO3: Design and Implement different ways of passing arguments to functions, Recursion and implement pointers concepts CO4: Develop a C program to manage collection of different data using structures, Union, user-defined datatypes and preprocessor directives CO5: Demonstrate C program to store and retrieve data using file concepts

LIST OF EXPERIMENTS

1. Implementation of Simple computational problems using various formulas.
2. Implementation of Problems involving Selection statements.
3. Implementation of Iterative problems e.g., sum of series.
4. Implementation of1D Array manipulation.
5. Implementation of2D Array manipulation.
6. Implementation of String operations.
7. Implementation of Simple functions and different ways of passing arguments to functions and Recursive Functions.
8. Implementation of Pointers
9. Implementation of structures and Union.
10. Implementation of Bit Fields, Type def and Enumeration.
11. Implementation of Preprocessor directives.
12. Implementation of File operations.

Total hours : 60

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	3		2	2							1		
CO2	1	3		3	3			2				2	3	
CO3	1	3		2	3			2				2		1
CO4	1	3		3	3			2				2	2	
CO5	1	3		2	3			2				2		1

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K.S.Rangasamy College of Technology – Autonomous R2018								
50 MA 006 - Transforms and Partial Differential Equations								
B.E. Civil Engineering								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	3	1	0	60	4	50	50	100

Objective(s)	• To develop the mathematical skills for solving partial differential equations. • To apply Fourier series for engineering discipline. • To appreciate physical significance of Fourier series techniques in solving one dimensional heat flow equations and one-dimensional wave equations. • To employ Fourier transform techniques in engineering field. • To introduce the concepts of Z- transform and its application to various problems related to engineering and technology.
Course Outcomes	**At the end of the course the students will be able to** CO1: Describe and solve the real time engineering problems using partial differential techniques. CO2: Apply analytical technique to express periodic functions in the given range as Fourier Series CO3: Apply Fourier series techniques to solve the boundary value problems. CO4: Make use of Fourier transform as the tool to connect the time domain and frequency domain in engineering problems. CO5: Analyze the concept of Z-transform as a valuable aid in analysis of continuous time systems.

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the numbers hours indicated.

PARTIAL DIFFERENTIAL EQUATIONS

Formation of partial differential equations – Singular integrals – Solutions of standard types of first order partial differential equations – Lagrange's linear equation – Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types. **[9]**

FOURIER SERIES

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Root mean square value of a function – Parseval's identity – Harmonic analysis**.** **[9]**

APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS

Classification of linear second order partial differential equations – Method of separation of variables – Fourier series solution of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two dimensional equation of heat conduction. **[9]**

FOURIER TRANSFORMS

Statement of Fourier integral theorem – Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity **[9]**

Z –TRANSFORMS

Z-transforms - Elementary properties - Initial and final value theorem – Inverse Z – transform – Partial fraction method – Residue method - Convolution theorem - Solution of difference equations using Z - transform. **[9]**

Total Hours: 45 + 15(Tutorial) = 60 hours

Text book(s):

1. B S Grewal,"Higher Engineering Mathematics", Khanna Publishers, 43rdEdition, 2014.
2. E Kreyszig, "Advanced Engineering Mathematics", John Wiley India Pvt Ltd, 10thEdition, 2016.

Reference(s):

1. T Veerarajan, "Engineering Mathematics (For Semester III)", Tata McGraw Hill Education Pvt Ltd, 3rd Edition, 2005.
2. N P Bali and Manish Goyal, "A Text book of Engineering Mathematics", Lakshmi Publications Pvt Ltd, 9th Edition, 2014.
3. G James, "Advanced Modern Engineering Mathematics", Pearson Education, 4thedition, 2011.
4. R C Wylie and L C Barrett, "Advanced Engineering Mathematics", Tata McGraw Hill Education Pvt Ltd, 6th Edition, 2012.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2						2	2	3	
CO2	3	3	3	2	2						2	2	3	
CO3	3	3	3	2	2						2	2	3	
CO4	3	2	2	2								2	3	
CO5	3	2	2	2								2	3	

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K.S.Rangasamy College of Technology – Autonomous								R2018
50 CE 301 - Strength of Materials								
B.E. Civil Engineering								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	3	1	0	60	4	50	50	100

Objective(s)	• To learn the fundamental concepts of Stress, Strain and deformation of solids. • To know bending stress and shear stress distribution in various sections. • To calculate the deflection of beams under the application of external forces. • To evaluate the performance of columns. • To assess the behaviour of shaft, Cylinders and springs.
Course Outcomes	**At the end of this course the students will be able to** CO1: Understand various types of stresses and strains developed in the member. CO2: Sketch the bending and shear stress distribution of a member. CO3: Compute the deflection of beams by different methods and selection of method for determining slope or deflection. CO4: Describe the failure modes for various types of columns. CO5: Analyze the members subjected to torsion.

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

Stress, Strain and Deformation of Solids

Introduction – Stress, Strain – Types – Elastic limit – Hooke's law – Stress Strain curves – Elastic constants – Relationship between Elastic constants. Simple and Compound bars – Principles of Superposition – Varying cross section – Thermal stress in composite bars - Principal stresses and principal planes. **[09]**

Bending and shearing stress

Theory of simple bending – bending equation –Flexural rigidity- Bending stress distribution in symmetrical sections. Shear stress-Variation of shear stress in beam cross section – Shear stress distribution for symmetrical sections. **[09]**

Deflection of Beams

Deflection: Methods - Integration method, Macaulay's method, Conjugate beam method, Area moment Method. **[09]**

Compression Members

Column / strut : Types- modes of failure-Factor of safety- Euler's expression for crippling load for different end conditions - Rankine's Gordon formula-Combined and bending stress-Core section. **[09]**

Torsion of shaft, Cylinders and Springs

Theory of simple torsion –torsion equation - Torsional rigidity - Polar modulus - Stresses in solid and hollow circular shafts – Power transmitted by a shaft. Springs: Types-Applications-Deflection.Thin and Thick Cylinder: Analysis – internal pressure – deformation – Introduction to compound cylinders. **[09]**

Total Hours: 45 + 15(Tutorial) = 60 hours

Text book(s):

1	R K Bansal, "Text book of Strength of Materials", Laxmi Publications Pvt. Ltd, New Delhi, 2012.
2	R K Rajput, "Strength of Materials", S.Chand & Company Ltd, New Delhi, 2015.

Reference(s):

1	F P Beer and E R Johnston, "Mechanics of Materials", Tata McGraw Hill, New Delhi,2014
2	Egor P Popov, "Engineering Mechanics of Solids", Prentice Hall of India, New Delhi, 2009.
3	S Ramamrutham, "Strength of materials", Dhanpat Rai Publishing Company, New Delhi, 2014.
4	S Timoshenko, "Strength of Materials", C B S Publishers & distributors, New Delhi, 2002

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COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO2
CO1	3	3	1	1	3	3	3	1				3	3	2
CO2	2	3	2	2	2	2	3	1				2	3	2
CO3	3	3	1	2	3	2	2	1				1	3	2
CO4	3	2	1	3	2	2	2	1				3	3	2
CO5	3	2	1	1	2	2	3	1				1	3	2

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K.S.Rangasamy College of Technology - Autonomous								R2018
50 CE 302 - Fluid Mechanics and Hydraulic Machinery								
B.E – CIVIL ENGINEERING								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	3	1	0	60	4	50	50	100

Course Objectives	• To be able to study the importance of various properties of fluids. • To study on open channel flow and brief description on different types of flows. • To learn the fundamentals of Uniform and Non-Uniform flow in open channels. • To gain knowledge about the concepts of specific energy, critical flow and their applications. • To impart the knowledge on pumps and turbines.
Course Outcomes	**At the end of this course the students will be able to** CO1: Recall the properties of fluids CO2: Study the different types of flows and channels. CO3: Gain knowledge on measurement of flow CO4: Apply boundary layer theory and momentum principles. CO5: Classify the pumps and turbines and analyse its performance

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

Fluid Statics: Dimensions and units: Physical properties of fluids- specific gravity, viscosity surface tension, Vapour pressure and their influence on fluid motion- Measurement of pressure- Piezometer, U-tube and differential manometers. **Fluid kinematics:** stream line, Path line and streak lines, classification of flows-steady & unsteady, uniform and non-uniform, laminar and turbulent, rotational and irrational flows. **[09]**

Fluid dynamics: surface and body forces –Euler's and Bernoulli's equations for flow along a stream line - Momentum equation and its application. **Closed conduit flow:** Reynold's experiment- Darcy Weisbach equation- Minor and Major losses in pipes - pipes in series and pipes in parallel - total energy line - hydraulic gradient line. **Measurement of flow:** Pilot tube, Venturimeter, Orifice meter and Flow nozzle. **[09]**

Boundary Layer and Flow Through Pipes Definition of boundary layer – thickness and classification – displacement and momentum thickness – development of laminar and turbulent flows in circular pipes – pipe network. **[09]**

Pumps: Classification and working - Work done – Monomeric head and static head - losses and efficiencies - specific speed - Pumps in series and parallel - Performance characteristic curves**.** **[09]**

Turbines: Classification of turbines - Impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine - Working proportions, Work done, Efficiencies - Draft tube – Cavitation. **Performance of hydraulic turbines:** Specific speed and runway speed. **[09]**

Total Hours: 45 + 15(Tutorial) = 60 hours

Text book(s):

1	Bansal, R.K., "A text book of Fluid Mechanics and Hydraulic Machines", Laxmi Publications, New Delhi, 2014.
2	Rajput, R.K., "A Text book of Fluid Mechanics and Hydraulic Machines", S. Chand Publishing Ltd., New Delhi, 2013.

Reference(s):

1	Modi, P.N. and Seth, S.M., "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House, New Delhi, 2015.
2	Subramanian, K., "Fluid Mechanics and Hydraulic Machines – Problems and Solutions", Tata McGraw Hill Education, New Delhi, 2010.
3	Giles, R.V., Evett, J.B. & Liu, C., "Fluid Mechanics and Hydraulics", Tata McGraw Hill, New Delhi, 2015.
4	R.S.Khurmi, "Fluid mechanics& hydraulic Machines. (in S.I. units)" S CHAND & Company Limited, 2015.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	3	1		3	1	1	3		1	3	2
CO2	3	3	1	3	1			1	1				3	2
CO3	3	2	3	1	1			1		1		3	2	2
CO4	3	2	3	3	1		3	1					3	1
CO5	3	3	3	3	2			1	1	3		1	2	1

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K.S.Rangasamy College of Technology – Autonomous								R2018
50 CE 303 - Surveying and Geomatics								
B.E. Civil Engineering								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	3	0	0	45	3	50	50	100

Objective(s)	• Aware of various functions of surveying instruments. • Calculate horizontal angle using prismatic and surveyor compass and understand plane table surveying. • Compute levels using leveling instruments and angles by theodolite. • Impart a clear understanding on the working principle & use of tachometer. • Make them familiar to the term geomatics and its importance in conducing the advanced surveying and mapping with help of modern map making tool Geographic Information System (GIS).
Course Outcomes	**At the end of this course the students will be able to** CO1: Aware of basic concepts of surveying its principles and usage of Chain, tape, Compass and Plane table instruments CO2: Determine the reduced level obtained by leveling and prepare contour maps and Calculate the earth work volume and capacity of reservoirs additionally Measuring the horizontal, vertical angles including tachometry using theodolite. CO3:.Describe the Setting out the curve in field, conduct control surveying and possible errors and rectification in surveying. CO4:.Explain Photogrammetry and data acquisition process, creation of stereo model and preparation of DTM,DEM, Aero triangulation and making of Ortho photos. CO5: Familiar the Geographic Information System(GIS) as effective modern map making tool

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

Chain, Compass and Introduction to plane table surveying

Definition – Principles – Classification – Scales – Conventional signs – Survey instruments, their care and adjustment(Temporary and permanent adjustments). Chaining and Ranging - ranging – types– Traversing. Compass – Types - Bearing – Systems and conversions – Local attraction - Magnetic declination – Dip – Traversing. Brief introduction on Plane table surveying and its types. **[09]**

Leveling, Vertical and Horizontal angle measurements

Basic terms related to leveling – Leveling instruments – Fly and check leveling – Booking – Reduction Longitudinal and cross sections – Plotting – Calculation of areas and volumes – Contouring : Methods Characteristics and uses of contours. Theodolite : Types – Description and uses – Measurement of Horizontal and Vertical angles – Heights and distances – Traversing. Tachometry: Principle – methods. **[11]**

Curves and Control surveying

Definition – Types – Elements of Simple Curve –Setting out of Simple curves – Linear methods - Instrumental Methods – Compound, Reverse and Transition curve - Functions and requirements of– Types of Vertical curves. Trigonometric leveling - Working from whole to part – Horizontal and vertical control methods – Triangulation – Signals – Base line – Satellite station – Reduction to centre – Analysis of triangulation networks - Total Station: Uses – Features – Setting up – Orientation – Electronic Data Recording Field procedures – Care and adjustments of electronic instruments. **[11]**

Geomatics

Definition - Purpose - Data acquisition – Photogrammettry - Aerial photographs -Types-flight planning- creation of stereo model – DTM - DEM - Digital aero triangulation - Ortho photograph - Satellite platforms-resolution types – Image interpretation. Introduction to cartography-map – scale - Coordinate system – Map projection types – UTM - Datum**.** GPS: Concept and Techniques – GPS segments and Tracking system; Cadastral mapping-(LIS). **[07]**

Geographical information System(GIS)

Definition – Historical perspective - fundamental units and components of GIS - Input and output devices. Data types- Spatial and Non spatial - Raster and vector data. Data conversion-vector to raster, raster to vector. Data structure– data storage and retrieve- Data manipulation. Data processing-Image classification- supervised and un supervised classification –Topology creation and Data analysis – Data output- Queries in GIS. **[07]**

Total Hours: 45

Text book(s):

1	B C Punmia, “Surveying”, Vol. I & II, Laxmi Publications, New Delhi, 2016.
2	Thomas Lillesand, W Ralph, Kiefer, Jonathan Chipman, “Remote Sensing and Image Interpretation,” 7th Edition, Wiley, 2015.
3.	Peter Alan Burrough, A Rachael, Mc Donnell, “Principles of Geographical Information Systems” 2nd Edition 2002.

Reference(s):

1	N N Basak, “Surveying and Levelling”,Tata McGraw Hill, New Delhi, Second Edition, 2014.
2	C Venkatramaiah, “Text book of surveying”, Universities Press (India) Private Ltd, Second Edition, 2011.
3	T P Kanetkar, “Surveying and Leveling”, Vol. I & II, United Book Corporation, 2006.
4.	F Floyd, Sabin’s, “Remote Sensing principle and practice”, Levant Books,3rd Edition, 2012.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO 2
CO1	2	2	-	3	3	2	1	2		2		1	2	3
CO2	3	3				3		1		1			2	3
CO3	3	2	3	2		1	2	1		2	1	1	2	3
CO4	1		2		3			2	2	1		3	2	3
CO5	2	2		1	3	1	1	2		2	2	3	2	3

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K.S.Rangasamy College of Technology – Autonomous								R2018
50 CE 304 - Construction Materials and Practices								
B.E. Civil Engineering								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	3	0	0	45	3	50	50	100

Objectives	• To impart the fundamental knowledge about building materials and building component • To enable students to learn basic concepts of masonry and blocks. • Understand the various functions of construction materials. • To learn about both the conventional and modern materials. • To acquire knowledge about the common practices in Civil Engineering construction.
Course Outcomes	**At the end of the course, the students will be able to** CO1. Identify the components of substructure and superstructure of a building. CO2. Express the knowledge the types of flooring materials, and generate its uses based on the importance of building. CO3. Summarise the types of roofing materials, and generate its uses based on the importance of building CO4. Analyse the applications of geo textiles, paints, varnishes, distempers and wood based products CO5. Identify the different methods of centering, shuttering, joints water proofing materials and construction equipment

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

Building component and Materials for Masonry

Selection of site for building- Substructure-Bearing capacity of soil-Requirement of good foundation-Types of foundation-Superstructure-Technical terms: Types-Brick masonry –Stone masonry- hollow blocks – fly ash bricks - Interlocking blocks. **[09]**

Materials for Flooring and Roofing

Types, usage and selection of flooring materials: granite, marbles, ceramics, vitrified tiles, mosaic, wooden and synthetic flooring. Types of roof covering materials: asbestos, galvanizing sheet and cement concrete. **[09]**

Other Building Materials

Types, properties and applications of: geo textiles, paints, varnishes, distempers and wood based products (interior work) **[09]**

Construction Practices

Site Clearance – Marking – Earthwork – temporary shed – centering and shuttering– form works – scaffoldings - laying of bricks - construction joints – movement and expansion joints – weather and water proof – roof finishes. **[09]**

Construction Equipment

Selection of equipment for earth work: power shovel, scrapers, earth moving equipment – tractors, tipper, dumper, front end loaders – Equipment for foundation: pile driving – Equipment for concreting, batching, mixing, conveyors and compaction. **[09]**

Total Hours: 45

Text book(s):

1. Rajput R K., “Engineering Materials”, S Chand and Company Ltd., 2014
2. Arora S.P. and Bindra S.P., “Building Construction, Planning Techniques and Method of Construction”, Dhanpat Rai and Sons, 2010.

Reference(s):

1. Santhakumar A.R., “Concrete Technology”, Oxford Publications, New Delhi, 2018
2. Shetty M.S., “Concrete Technology (Theory and Practice)”, S Chand and Company Ltd., 2018
3. Jha J and Sinha S.K., “Construction and Foundation Engineering”, Khanna Publishers, 7th edition, 2010.
4. Sharma S.C., “Construction Equipment and Management”, 5thedition, Khanna Publishers New Delhi, 2010

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COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	2	2	2	3	1	3	1	3	3	2	3
CO2	2	3	2	3	2	3	3	2	1		1		3	3
CO3	2	2	2	3	2	2	3				3	1	2	2
CO4	2	3	2	2	3	2	2	2	3	1		3	2	2
CO5	3	2	3	3	2	3	3	1	1	3	3	1	2	3

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50 MY 004 - Universal Human Value

Semester	Hours / Week			Total Hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	2	1	0	45	3	50	50	100

Objective(s)	• To identify the essential complementarily between 'values' and 'skills' • To ensure core aspirations of all human beings. • To achieve holistic perspective towards life and profession • To acquire ethical human conduct, trustful and mutually fulfilling human behaviour • To enrich interaction with Nature.
Course Outcomes	**At the end of the course, the students will be able to** CO1: Become more aware of themselves, and their surroundings CO2: Responsible in life, and in handling problems with sustainable solutions CO3: Maintain human relationships and human nature CO4: Committed towards human values, human relationship and human society CO5: Improve critical ability and apply it day-to-day life

Note: Hours notified against each unit in the syllabus are only indicative but are not decisive. Faculty may decide the number of hours for each unit depending upon the concepts and depth. Questions need not be asked based on the number of hours notified against each unit in the syllabus**.**

Introduction to value Education **[9]**

Understanding value Education-Self exploration as the process for value education-Continuous Happiness and prosperity-the basic human aspirations-right understanding-relationship and physical facility –happiness and prosperity - current scenario – method to fulfill the basic human aspirations

Harmony in the Human Being **[9]**

Understanding Human being as the Co-Existence of the self and the Body-Distinguishing between the needs of the self and the body-the body as an instrument of the self-understanding harmony in the self-harmony of the self with the body – programme to ensure self-regulation and health

Harmony in the Family and Society **[9]**

Harmony in the Family –the basic unit of human interaction-values in human- to - human relationship –'Trust' the foundation value in relationship –'Respect'- as the right evaluation-understanding harmony in the society – vision for the universal human order.

Harmony in the Nature/Existence **[9]**

Understanding harmony in the Nature-Interconnectedness, self-regulation and mutual fulfillment among the four orders of nature – realizing existence as co-existence at all levels –the holistic perception of harmony in existence.

Implications of the Holistic Understanding **[9]**

Natural Acceptance of human values- definitiveness of human conduct- a basis for humanistic education, humanistic constitution and universal human order- competence in professional ethics –holistic technologies, production systems and management models-typical case studies – strategies for transition towards value base life and profession

Total Hours: 45

Text Book(s):

1.	A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2.	Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

Reference(s)

1.	Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2.	Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

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COs	POs											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	3	3	3	2	2	3	3	3	2	3	3	1
CO2	3	3	3	2		3	3	3	2	3	2	1
CO3	3	3	2			3	3	3	3	3	2	1
CO4	3	3	3			3	3	3	3	3	2	2
CO5	3	3	1			3	3	3	3	3	2	2

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K.S.Rangasamy College of Technology - Autonomous								R2018
50 CE 3P1 - Surveying Laboratory								
B.E. Civil Engineering								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	0	0	4	60	2	60	40	100

Objective(s)	• To Measure the surveying quantities Length, Area and Volume. • To Learn the horizontal and vertical angle measurements using compass and theodolite. • To get practice on Graphical surveying by practicing of Plane table surveying. • To make aware the concept leveling in surveying and contour making. • To handle the digital surveying instruments GPS and Total station.
Course Outcomes	**At the end of this course the students will be able to** CO1: Familiar to chaining, ranging and apply it to take the angular measurement and Identify local attraction and appropriate methods to rectify it. CO2: Calculate the irregular traverse area using Plane table methods, Collect the level of different points and calculate the reduced level of the respective points by appropriate methods. CO3: Apply the lens principle to find the tachometric constants. Setting out of curve by linear and angular methods and trigonometric leveling. CO4: Identify the ground co-ordinates with elevation of earth surface points with help of GPS and Calculate the area and volume using total station. CO5: Explain Aerial photo Interpretation through stereo model creation with help of provided aerial photographs.

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

1. Establish the compass traverse, Introduce the correction for local attraction and calculate the area for the same.
2. Calculate the area for the given irregular polygon by conducting plane table surveying methods : Radiation, Intersection and Traversing.
3. Find the elevation differences of the given area through finding the RL value of given points by height of the Instrument method and Rise & fall method.
4. Assess the horizontal and vertical angles of given points for transit.
5. Determine the tachometric constant of the analytical lens fixed transit theodolite
6. Prepare the calculation for execution of setting out of circular curve in instrument method types (single and double theodolite methods.
7. Apprise the gradient of the given land / topography through field observation of GPS
8. Adopt the computer aided contour plotting using surfer software
9. Establishment of traverse using total station and calculate the area.
10. Calculate the area and volume using total station on under prism mode
11. Create the Stereo model for the given aerial photographs and interpret the spatial objects present in it.

Total Hours: 60

1	Lab manual Prepared by KSRCT – Civil Department.

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Surveying virtual lab link From IIT Roorkee:

http://sl-iitr.vlabs.ac.in/sl-iitr/List%20of%20experiments.html?domain=Civil Engineering

Total station vertical and horizontal angle measurement:

http://sl-iitr.vlabs.ac.in/sl-iitr/exp4/Introduction.html?domain=Civil Engineering&lab=Surveying Lab

Study of various parts of auto level:

http://sl-iitr.vlabs.ac.in/sl-iitr/exp1/Introduction.html?domain=Civil Engineering&lab=Surveying Lab

Fly level check level measurement using Autolevel:

http://sl-iitr.vlabs.ac.in/sl-iitr/exp2/Introduction.html?domain=Civil Engineering&lab=Surveying Lab

Study of plane table accessories:

http://sl-iitr.vlabs.ac.in/sl-iitr/exp5/Introduction.html?domain=Civil Engineering&lab=Surveying Lab

Field contouring:

http://sl-iitr.vlabs.ac.in/sl-iitr/exp9/Introduction.html?domain=Civil Engineering&lab=Surveying Lab

Study of GPS:

http://sl-iitr.vlabs.ac.in/sl-iitr/exp10/Introduction.html?domain=Civil Engineering&lab=Surveying Lab

Field observations using GPS:

http://sl-iitr.vlabs.ac.in/sl-iitr/exp11/Introduction.html?domain=Civil Engineering&lab=Surveying Lab

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3	2		3	3				2	2		1	2	3
CO2	2	1		3	2	1			3				2	3
CO3	3	2	3	2		2	2	1	3	1	1		2	3
CO4	1		2	2	3				2			3	1	3
CO5	2	2		3	3			2	3		1	3	2	3

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K. S. Rangasamy College of Technology-Autonomous								R2018
50 CE 3P2 – Hydraulics Engineering Laboratory								
B.E – Civil Engineering								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	0	0	4	60	2	60	40	100
Course Objectives	• Able to verify the principles studied in theory by performing the experiments in laboratory. • Assess performance characteristics of orifice meters. • Determine losses in pipes. • Assess the performance characteristics Pumps. • Assess the performance characteristics Turbines.							
Course Outcomes	**At the end of the course, the student will be able to** CO1: Estimate the Co-efficient of discharge for orifice and Venturimeter. CO2: Compute the co-efficient of discharge for notches. CO3: Examine the major and minor losses in pipes. CO4: Evaluate the performance characteristics of Pelton, Francis and Kaplan turbines. CO5:Test the performance characteristics of centrifugal and reciprocating pumps							
Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.								
1. Determination of co-efficient of discharge for orifice (Constant head & Variable head). 2. Determination of co-efficient of discharge for notches. 3. Determination of co-efficient of discharge for venturimeter. 4. Determination of co-efficient of discharge for orifice meter. 5. Estimation of friction losses in pipes. 6. Estimation of minor losses in pipes. 7. Assessment on performance characteristics of Pelton turbine (Constant head). 8. Assessment on performance characteristics of Francis turbine (Constant head). 9. Assessment on performance characteristics of Kaplan turbine (Constant head). 10. Assessment on performance characteristics of Centrifugal pump and reciprocating pump								
Total Hours: 60								
Course Materials:								
1.	Lab Manual Prepared by KSRCT Civil Department							
2.	NPTEL Online Notes							
3	Virtual Lab – Demonstration Videos							

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	3	1		3		1	3	1		3	2
CO2	1	2		2	2	1		2	2				3	2
CO3	2	2	3	2	3				3		2	1	3	2
CO4	2	1	1	2			2		2				2	1
CO5	3	3	2	3	2	2			2	2		1	1	1

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K. S. Rangasamy College of Technology - Autonomous Regulation								R 2018
Semester III								
Course Code	**Course Name**	**Hours/Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**ES**	**Total**
50TP0P1	**Career Competency Development I**	**0**	**0**	**2**	**0**	**100**	**00**	**100**

Course Objectives	• To help learners to enrich their grammatical correctness and vocabulary efficacy in the academic and professional contexts. • To help the learners to frame syntactical structures of sentences and comprehend the meaning of reading passages effectively • To help learners to adeptly sequence the information, draft letters and correct usage of foreign words with correct spelling and punctuation. • To help the learners to introduce themselves and involve in situation conversations professionally • To help learners to make various modes of presentations and express their opinion in a conducive way.
Course Outcomes	**At the end of the course, the student will be able to** 1.Reinforce the essential grammatical correctness and vocabulary efficacy in the academic and professional contexts 2.Generate syntactical structures and infer the semantics in the reading passages effectively 3.Reorganize and compose the sequential information, letter drafts, and interpret the appropriate usage of foreign words with correct spelling and punctuation 4.Demonstrate their introduction and relate to situational conversations adeptly 5.Exhibit various modes of presentations and organize their opinions in an expressive way

Unit – 1	**Written Communication – Part 1**	**Hrs**
Usage of noun, pronoun, adjective (Comparative Forms), Verb, Adjectives, Adverb, Tenses, Articles and Preposition - Change of Voice - Change of Speech - Synonyms & Antonyms - One Word Substitution - Using the Same Word as Different Parts of Speech - Odd Man Out **Materials:** Instructor Manual, Word Power Made Easy Book		8
Unit – 2	**Written Communication – Part 2**	6
Analogies - Sentence Formation - Sentence Completion - Sentence Correction - Idioms & Phrases - Jumbled Sentences, Letter Drafting (Formal Letters) - Reading Comprehension (Level 1) - ContextualUsage - **Materials:** Instructor Manual, Word Power Made Easy Book		
Unit – 3	**Written Communication – Part 3**	4
Jumbled Sentences, Letter Drafting (Formal Letters) - Foreign Language Words used in English - -Spelling & Punctuation (Editing) **Materials:** Instructor Manual, News Papers		
Unit – 4	**Oral Communication – Part 1**	6
Self-Introduction - Situational Dialogues / Role Play (Telephonic Skills) - Oral Presentations-Prepared -'Just A Minute' Sessions (JAM) **Materials:** Instructor Manual, News Papers		
Unit – 5	**Oral Communication – Part 2**	6
Describing Objects / Situations / People, Information Transfer - Picture Talk - News Paper and BookReview **Materials:** Instructor Manual, News Papers		
	Total	**30**

Evaluation Criteria

S.No.	Particular	Test Portion	Marks
1	Evaluation 1 Written Test	50 Questions – 30Questions from Unit 1 & 2, 20 Questions from Unit 3, (External Evaluation)	50
2	Evaluation 2 Oral Communication 1	Self-Introduction, Role Play & Picture Talk from Unit-4 (External Evaluation by English and MBA Dept.)	30
3	Evaluation 3 Oral Communication 2	Book Review & Prepared Speech from Unit-5 (External Evaluation by English and MBA Dept.)	20
		Total	**100**

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Reference Books

1. Aggarwal, R.S. “A Modern Approach to Verbal and Non-verbal Reasoning”, Revised Edition 2008, Reprint 2009, S.Chand& Co Ltd., New Delhi.
2. Word Power Made Easy by Norman Lewis W.R. GOYAL Publications

Note:

- Instructor can cover the syllabus by Class room activities and Assignments (5 Assignments/week)
- Instructor Manual has Class work questions, Assignment questions and Rough work pages
- Each Assignment has 20 questions from Unit 1, 2 and Unit 5 and 5 questions from Unit 3 and 4
- Evaluation has to be conducted as like Lab Examination.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	1		2	1	2	3	3	2	3	1	3
CO2	1	1	1	1	1	2	1	2	3	3	3	3	2	3
CO3	1	1	1	1	1	2	1	2	3	3	2	3	3	3
CO4	1	1	1	1		2	1	1	2	3	2	3	2	3
CO5	1	1	1	1	1	2	1	2	3	3	2	3	3	3

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K.S.Rangasamy College of Technology – Autonomous								R2018
50 CE 401 - Structural Analysis								
B.E. Civil Engineering								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
IV	3	1	0	60	4	50	50	100

Objective(s)	• To introduce the students to basic theory and concepts of classical methods of structural analysis • To understand the concept of stresses and strains • To identify the best suitable method of analysis • Analyse arches with different end conditions. • To understand the behaviour of continuous beams subjected to different types of loadings.
Course Outcomes	**At the end of this course the students will be able to** 1. Analyze the structures using the Energy principles concepts. 2. Solve the problems in various arches with various loading condition. 3. Analysis the Beam, Trusses and frames using three moment equation. 4. Analysis the Beam and rigid frames using slope deflection equation. 5. Analysis the Beam and frames using moment distribution method.

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

Energy Principles

Strain energy and strain energy density: strain energy in axial, shear, flexure and torsion – Principle of virtual work – Energy theorems – Castigliano's theorems, Maxwell's reciprocal theorem, Engessor's theorem – Application of energy theorems for computing deflections in beams and trusses.

[09]

Arches

Analysis of three hinged and two hinged arches – parabolic and circular arches – Determination of Reaction, Normal thrust, Radial shear and Bending moment.

[09]

Theorem of three moments

Static and kinematic Indeterminacy – Beams, Trusses and frames; Analysis of statically indeterminate structures – Theorem of three moments (Only two dimension).

[09]

Slope Deflection Method

Continuous beams and rigid frames – symmetry and anti-symmetry loading – Deformed shape, Shear force and Bending moment diagram (Unknowns restricted to three only).

[09]

Moment Distribution Method

Basic concepts –, stiffness, distribution and carry over factors – Analysis of continuous Beams – plane rigid frames with and without sway – Deflected shape, shear force and bending moment diagrams.

[09]

Total Hours: 45 + 15(Tutorial) = 60 hours

Text book (s):

1. Thandavamoorthy, T.S. "Structural Analysis", Oxford University Press, New Delhi 2011.
2. Vaidyanadhan.R and Perumal.P, "Comprehensive structural Analysis – Vol.1 & Vol2", Laxmi Publications, New Delhi, 2010.

Reference (s) :

1. Ghali.A, Nebille, A.M. and Brown, T.G. "Structural Analysis" A unified classical and Matrix approach" – 5th edition. Spon press London and Newyork , 2009.
2. Hibbeler, R.C. "Structural Analysis" pearson Education (Singapore) Pvt. Ltd – Delhi – 110 092, 2009.
3. Rajesekaran, S. and Sankara Subramanian, G. "Computational structural mechanics, "Prentice Hall of India Pvt Ltd, New Delhi, 2001.
4. Vazrani.V.N And Ratwani, M.M, "Analysis of Structures, Vol.II", Khanna Publishers, 2015.

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50 CE 401 - Structural Analysis

List of MAT Lab Programmes

1. Introduction to MAT Lab
2. Analysis of Deflection by Energy theorem using MAT Lab
3. Determination of horizontal thrust in arches using MAT Lab
4. Analysis of indeterminate beams using MAT Lab
5. Analysis of continuous beams using MAT Lab

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3		1	1	1	2	1		3	3	2
CO2	3	3	3	3		2		1	1	1		3	3	2
CO3	2	3	3	2		1	1	1	2	2		3	3	2
CO4	2	3	3	2		1		1	1	2		3	3	2
CO5	2	3	3	1		2		1	2	1		3	3	2

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K. S. Rangasamy College of Technology-Autonomous								R2018
50 CE 402 - Soil Mechanics								
B.E. Civil Engineering								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
IV	3	1	0	60	4	50	50	100

Objectives(s)	• To provide students with basic understanding of physical and mechanical properties of soil. • To impart knowledge of basic index and engineering properties of soil • To identify factors controlling soil behavior and methods to determine soil properties. • To acquire basic knowledge in engineering design of geotechnical systems • To Analyse the stability of slopes with protection measures.
Course Outcomes	**At the end of the course, the student will be able to** 1. Impart the fundamental concepts of soil mechanics and identify the soil properties 2. Understand the importance engineering properties such as Consolidation and compaction of soils 3. Understand the knowledge aspects of Shear strength 4. Evaluate the stress developed in the soil medium 5. Analyse the stability of slopes.

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

Soil Classification and Compaction

Nature of soil – phase relationships – Soil description and classification for engineering purposes- their significance – Index properties of soils - BIS Classification system; Soil compaction :Theory-comparison of laboratory and field compaction methods- Compaction – Proctor's test – Moisture – density relations -Factors influencing compaction behaviour of soils. **[09]**

Effective Stress Principle and Permeability

Soil water :static pressure in water - Effective stress concepts in soils – capillary stress; Permeability measurement in the laboratory and field pumping in and pumping out tests – factors influencing permeability of soils; Seepage – Introduction to flow nets – Simple problems. **[09]**

Stress Distribution Concept and Settlement

Stress distribution - soil media – Boussinesq theory - Use of New marks influence chart; Settlement: Components of settlement –– immediate and consolidation settlement - Methods of minimising settlement – Terzaghi"s one dimensional consolidation theory – computation of rate of settlement – square root 't' and log t methods– e-log p relationship - Factors influencing compression behaviour of soils. **[09]**

Shear Strength Behaviour of Soil

Shear strength of cohesive and cohesionless soils – Mohr's and Coulomb's failure theory – Relationship between principal stresses at failure - Measurement of shear strength: Direct shear Test – Triaxial compression Test - Unconfined Compression Test and Vane shear Test; Pore pressure parameters: cyclic mobility – Liquefaction. **[09]**

Stability of Slopes

Slope failure mechanisms – Types: infinite slopes – finite slopes; Total stress analysis for saturated clay – Fellenius method - Friction circle method; Factor of safety - use of stability number; Slope protection measures. **[09]**

Total Hours: 45 + 15(Tutorial) = 60 hours

Text book (s):

1	Gopal Ranjan, "Basic and Applied Soil Mechanics" New Age International, New Delhi, 2011.
2	Punmia, B.C. "Soil Mechanics and Foundations", Laxmi Publications, New Delhi, 2014.

Reference (s) :

1	Braja M. Das, "Principles of Geotechnical Engineering", Cengage learning Pvt. Ltd, 8th Edition, 2014.
2	Holtz D. and Kovacs, W.D., "An Introduction to Geotechnical Engineering", Prentice Hall, 2nd Edition, 2011.
3	Purshotam Raj,P. "Geotechnical Engineering", Tata McGraw Hill , 2013
4	Alam Singh and Chowdhary, G.R., "Soil Engineering in Theory and Practice", Volume-2, Geotechnical testing and instrumentation, CBS Publishers and Distributors, New Delhi, 2006.

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50 CE 402 - Soil Mechanics

List of MAT Lab Programmes

1. Introduction to MAT Lab
2. Soil Classification using MAT Lab
3. Permeability Test using MAT Lab
4. Dewatering System Control by using MAT Lab
5. Soil Liquefaction Analysis using MAT Lab

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3		1	2			3			1		3	2
CO2	3	2				2	1	1				2	3	2
CO3	3	3	3	1	1		2			1			3	2
CO4	2	2	1	1	3			1	2		1		3	2
CO5	2	2			2		1	2		2		2	3	2

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K. S. Rangasamy College of Technology-Autonomous								R2018
50 CE 403 - Water Supply Engineering								
B.E. Civil Engineering								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
IV	3	0	0	45	3	50	50	100

Objectives(s)	• To recognize the treatment of water including the estimation of quantity of water. • To identify about the design principles involved in treatment of municipal water. • To acquire knowledge on water distribution systems. • To learn the construction of water treatment plant. • To impart students with strong knowledge on collection and conveyance of water.
Course Outcomes	**At the end of the course, the student will be able to** CO1 Identify the sources of water supply and analyse the characteristics of water. CO2 Classify the intake structures, pipes and pumps. CO3 Design the water treatment plant and other unit operations CO4 Express the analysis of distribution networks and house service connections. CO5 Outline the various advanced water treatment methods

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

Sources of Water Supply

Importance and necessity for planned public water supplies – planning and execution of modern water supply systems – design period ,population forecasting, water demand – sources of water and their characteristics – surface and ground water – impounding reservoir – development and selection of source - surface water quality – characterization significance – drinking water quality standards – (IS – WHO) **[09]**

Conveyance From The Sources

Intake structures – factors governing the location of an intake – types of intakes – functions – pipes and conduits for transporting water – pipe materials – hydraulics of flow in pipes – transmission main design – laying, jointing and testing of pipes – appurtenances of pipes – types of pumps – selection of pumps. **[09]**

Water Treatment

Unit operation and process – design of water treatment plant units, aerators, flash mixers, sedimentation, coagulation, and flocculation – clariflocculator and sand filters – principles of disinfection – residue management – construction, operation and maintenance of treatment plants. **[09]**

Water Distribution Systems And Supply

Requirements of a good distribution systems – layout of distribution networks – selection of pipes – service reservoirs – methods of distributions – network design – analysis of distribution networks – appurtenances – leak detection – principles and design considerations for water supply in buildings – house service connections – plumbing systems – pipe fitting and water pipe systems in buildings. **[09]**

Advanced Water Treatment

Water softening - desalination – reverse osmosis – Ion exchange – adsorption – membrane process – RO reject management – fluoride removal – ozonation – construction, operation and maintenance aspects – recent technologies. **[09]**

Total Hours: 45

Text book(s):

1	Garg,S.K., “Water Supply Engineering– I”, Khanna Publishers, New Delhi, 2019.
2	Modi, P.N., “Water Supply Engineering – I”, Standard Book House, New Delhi, 2018.

Reference(s):

1	Punmia, P.C., Ashok Jain and Arun Jain, Water Supply Engineering , Lakshmi Publications (P) Ltd., New Delhi ,2017.
2	Subhash verma, Varinder singh Kanwar and Siby John, Water Supply Engineering, Vikas Publishing House,2016
3	Rangwala, Water Supply Engineering and Sanitary Engineering, Charotar Publishing House Pvt. Ltd., 2015
4	Lal, D and Upadhyay, A.K. Water Supply and Waste Water Engineering, S.K Kataria and Sons, 2015.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2		1	2	2	1	3	2			2	3
CO2	2	2	2		2	2	3	1	3		3		2	2
CO3	2	1	2	3		1	2	2	3	3			3	3
CO4	3	2	1			2			2				2	3
CO5	2	1	2		1	3		2	1		3		2	3

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K.S.Rangasamy College of Technology - Autonomous								R2018
50 CE 404 - Engineering Geology								
B.E. Civil Engineering								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
IV	3	0	0	45	2	50	50	100

Objective(s)	• To perceive the various geological Land forms their types and importance. • To make aware the nature and behaviors' of seismic waves and its connection to of structural stability. • To acquire knowledge about different varieties of building materials, its strength and distribution. • To identify different types of rocks in field based on its nature and origin and also identify fold, fault, joints in field. • To Conduct the geological site investigation for dams, tunnels etc., through aerial and Geophysical survey.
Course Outcomes	**At the end of this course the students will be able to** 1. Realize the importance of geology and relate the structure and dynamic properties of earth 2. Identify formation of crystal and minerals, various crystallographic systems and physical properties and their family and study the behavior of clay. 3. Classify the different rock types in field and engineering properties of individual rock types can be explained. 4. Familiar the concept about Earthquakes and recognize the geological structures fold, fault, joints in field for constructing dams, bridges, buildings, etc 5. Interpret the air photo and satellite imageries and Identify the sub surface geological formations and its nature for major structures by conducting geophysical survey.

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

Introduction to Geomorphology & Hydrogeology

Geology in Civil Engineering – branches of geology – earth Structures and composition –continental drift and plate technologies. Weathering – types- Landforms of rivers, wind and sea. Hydrological cycle; properties of water bearing Geological formation: Aquifers and their types; Ground water exploration; Sea water intrusion and remedial measures Importance in Civil Engineering. **[09]**

Mineralogy

Crystallographic systems – Physical properties of minerals –Rock forming minerals: Quartz and Feldspar family, Augite, Hornblende, Biotite, Muscovite, Calcite, Garnet; Properties, behavior and engineering significance of clay minerals – Coal and petroleum: Origin and occurrence in India. **[09]**

Petrology

Classification of rocks – Distinction between igneous, sedimentary and metamorphic rocks – Description, occurrence, Engineering properties: Igneous rocks – Granite, Syenite, Diorite, Gabbro, Pegmatite, Dolerite and Basalt; Sedimentary rocks: Sandstone, Limestone, Shale, Conglomerate and Breccia; Metamorphic rocks: Quartizite, Marble, Slate, Phyllite, Gniess and Schist. **[09]**

Geodynamics & Rock Mechanics

Forces caused for uncertainty of structures – Earthquake - types - Earthquake belts in India - Volcano – Types - Landslides; causes, effects and remedial measures - Stress, strain and deformational effects on different rocks; Attitude of beds – Outcrops – Study of structures – Fold, fault and joint – influence in civil engineering - Seismic and Electrical methods for Civil Engineering investigations. **[09]**

Geological Investigations for Civil Engineering Structures

Site selection for Civil Engineering projects - Study of topo sheets and geological maps - Litho logical and structural features studies for construction of Dams, Reservoirs, Tunnels, Bridges and Highways through seismic and electrical methods of geophysical investigations. **[09]**

Total Hours: 45

Text book(s):

1	Parbin Singh, "Engineering and General Geology", Katson Publication House, New Delhi, 2010.
2	Venkat Reddy, D. "Engineering Geology", Vikas Publishing House Pvt. Lt, 2010.

Reference(s):

1	Legeet, "Geology and Engineering", McGraw-Hill Book Company, NewYork**,** 2008.
2	Todd D.K.,"Ground water Hydrology", John Wiley and Sons, Third edition New York. 2004
3	Karanth, K.R. "Ground water assessment, development and management", Tata Mc Graw Hills,1987.
4	Ravi, P. Gupta, "Remote sensing Geology", Springer Verilag, New York, 2003.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	1		2	3		2	2	2		1			2	3
CO2		2	1		2	1	2	3	1	2		1	2	3
CO3	1		2			1				3		1	2	3
CO4	3	2	3		2	2	2	2		2		1	2	3
CO5	2	2		3		2	1	1	2	1		2	2	3

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K.S.Rangasamy College of Technology - Autonomous								R2018
50 CE 405 - Concrete Technology								
B.E. Civil Engineering								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
IV	3	0	0	45	3	50	50	100

Objective(s)	• To acquire knowledge about the properties of concrete and concreting methods • To understand the Mix design using IS method. • To conduct various tests on properties of cement, fine aggregate and coarse aggregate • To understand the properties of fresh and hardened concrete. • To gain knowledge about properties and applications special concretes
Course Outcomes	**At the end of the course the students be able to** 1. Identify the functional role of ingredients of concrete including their specifications and properties 2. Design concrete mix according to the quality control techniques described in codal provisions 3. Distinguish fundamental knowledge in the fresh and hardened properties and influent effects in properties of concrete 4. Outline the manufacturing process of concrete and special concreting methods 5. Evaluate the properties and applications of different types of special concretes

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

Concrete Making Materials

Cement: Chemical composition and Properties – Test on cement – IS Specifications – Hydration of cement – Gel-Space ratio – Abraham's law, Aggregates: Grading and Tests as per BIS Specification – Alkali aggregate reaction – Thermal properties of aggregates, Water: Quality of water for use in concrete, Admixtures: Their effects on concrete properties. **[09]**

Mix Design

Principle of concrete mix design – factors influencing mix design - Nominal and Design mix- IS and ACI Method of concrete mix design. **[09]**

Properties of Concrete

Fresh Concrete: Workability – Measurement of workability – Factors affecting workability. Hardened Concrete: Strength – Stress-Strain Characteristics – Shrinkage – Creep – Permeability – Durability and Thermal properties. **[09]**

Concreting Methods

Concrete: manufacturing Process, methods of transportation, placing, compacting and curing – special concreting methods: Ready Mix Concrete, Pumping of concrete, Vacuum dewatering, underwater concrete – Cold and Hot weather Concreting. **[09]**

Special Concretes

Properties and Applications: Light weight concrete - Ferro-cement - Fibre reinforced concrete - Polymer Concrete - Air entrained concrete -High performance concrete - High strength concrete - Self compacting concrete - Self curing concrete and Geo-polymer concrete. **[09]**

Total Hours: 45

Text book(s):

1	Shetty, M.S., "Concrete Technology", S.Chand and Company Ltd., Delhi, 2018.
2	Santhakumar, A.R., "Concrete Technology", Oxford University Press, New Delhi, 2018.

Reference(s):

1	Neville, A.M., "Properties of Concrete" , 5th Edition, John Wiley & Sons (Asia) Pvt. Ltd., 2011.
2	Gambhir, M.L., "Concrete Technology", Tata McGraw Hill Company Ltd., Delhi, 2014.
3	M.S.Shetty, A.K.Jain, "Concrete Technology: Theory and Practice", S.Chand Publishing, 2018.
4	J.J. Brooks A. M. Neville, "Concrete Technology", Pearson Education, 2019.

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CO1	3	3	2	2	2	2	3	3	2	2	3	3	2	2
CO2	3	2	3	2	3	2	3	2	1	2	1		2	2
CO3	2	2	3	2	2	2	2	2	3	1	3	1	2	3
CO4	3	2	2	3	2	2	3	2	2	3		3	2	3
CO5	2	3	3	2	3	3	2	3	1	2	3	1	3	3

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K.S.Rangasamy College of Technology – Autonomous								R2018
50 MY 014 - Start-ups and Entrepreneurship								
B.E. Civil Engineering								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
IV	2	0	0	30	0	100	-	100

Objective(s)	• To provides practical proven tools for transforming an idea into a product or service that creates value for others. • To build a winning strategy, how to shape a unique value proposition, prepare a business plan • To impart practical knowledge on business opportunities • To inculcate the habit of becoming entrepreneur • To know the financing, growth and new venture & its problems
Course Outcomes	**At the end of this course the students will be able to** 1. Transform ideas into real products, services and processes, by validating the idea, testing it, and turning it into a growing, profitable and sustainable business. 2. Identify the major steps and requirements in order to estimate the potential of an innovative idea as the basis of an innovative project. 3. Reach creative solutions via an iteration of a virtually endless stream of world-changing ideas and strategies, integrating feedback, and learning from failures along the way. 4. Apply the 10 entrepreneurial tools in creating a business plan for a new innovative venture. 5. Apply methods and strategies learned from interviews with startup entrepreneurs and innovators.

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

Introduction to Entrepreneurship & Entrepreneur **[6]**

Meaning and concept of Entrepreneurship, the history of Entrepreneurship development, Myths of Entrepreneurship, role of Entrepreneurship in Economic Development, Agencies in Entrepreneurship Management and Future of Entrepreneurship.

The Entrepreneur*:* Meaning, the skills required to be an entrepreneur, the entrepreneurial decision process, Role models, Mentors and Support system.

Business Opportunity Identification and Preparing a Business Plan **[6]**

Business ideas, methods of generating ideas, and opportunity recognition, Idea Generation Process, Feasibility study, preparing a Business Plan: Meaning and significance of a business plan, components of a business plan.

Innovations **[6]**

Innovation and Creativity - Introduction, Innovation in Current. Environment, Types of Innovation, School of Innovation, Analysing the Current Business Scenario, Challenges of Innovation, Steps of Innovation Management, Experimentation in Innovation Management, Participation for Innovation, Co-creation for Innovation, Proto typing to Incubation. Blue Ocean Strategy-I, Blue Ocean Strategy-II. Marketing of Innovation, Technology Innovation Process

Financing & Launching the New Venture **[6]**

Importance of new venture financing, types of ownership, venture capital, types of debt securities, determining ideal debt-equity mix, and financial institutions and banks.

Launching the New Venture: Choosing the legal form of new venture, protection of intellectual property, and formation of the new venture

Managing Growth & Rewards in New Venture **[6]**

Characteristics of high growth new ventures, strategies for growth, and building the new ventures.

Managing Rewards: Exit strategies for Entrepreneurs, Mergers and Acquisition, Succession and exit strategy, managing failures - bankruptcy

Total Hours: 30

Text book(s):

1	Stephen Key, “One Simple Idea for Startups and Entrepreneurs: Live Your Dreams and Create Your Own Profitable Company” 1st Edition, Tata McGrawhill Company, New Delhi, 2013.
2	Charles Bamford and Garry Bruton, “ENTREPRENEURSHIP: The Art, Science, and Process for Success”, 2nd Edition, Tata McGrawhill Company, New Delhi, 2016.

Reference(s):

1	Philip Auerswald, “The Coming Prosperity: How Entrepreneurs Are Transforming the Global Economy”, Oxford University Press, 2012.
2	Janet Kiholm Smith; Richard L. Smith; Richard T. Bliss, “Entrepreneurial Finance: Strategy, Valuation, and Deal Structure, Stanford Economics and Finance”, 2011
3	Edward D. Hess, “Growing an Entrepreneurial Business: Concepts and Cases”, Stanford Business Books, 2011
4	Howard Love, “The Start-Up J Curve: The Six Steps to Entrepreneurial Success”, Book Group Press, 2011

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CO1	3	3	3	3	1	3	1	2	1		2	2	2	1
CO2	2	3	3	2	2		2	2	2		2	2	3	
CO3	3	2	3	1	2				1	3	1	3	3	
CO4	3	3	3	3	3	2	2	1		1	3	3	3	
CO5	3	2	3	3	3			2			3	2	2	

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K.S.Rangasamy College of Technology-Autonomous								R2018
50 CE 4P1 – Building Planning and Drafting Laboratory								
B.E Civil Engineering								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
IV	0	0	4	60	2	60	40	100

Course Objectives	• To know the latest techniques used in drafting software. • To prepare building plan, section and elevation for various buildings. • To know how to draw section for various buildings. • To prepare elevation for different types of buildings. • To gain knowledge about approval of various building plans.
Course Outcomes	**At the end of the course, the student will be able to** 1. Develop any type of building drawing using CADD software. 2. Create layout plan, sanction drawings, working drawings using CADD software. 3. Sketch sectional view and elevation for different buildings. 4. Explore modern drafting tools in teams and prepare a report and able to present it. 5. Practice the various comments used in modern drawing software.

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

1. Preparation of key plan
2. Preparation of site plan
3. Preparation of building component
4. Load bearing structure
5. Framed structure
6. Library building
7. Preparation of primary school building
8. Preparation of primary health care centre
9. Plumbing and wiring
10. Water supply and sanitary facilities

Total Hours: 60

Text book(s):

1. SeshaPraksh, M.N. & Dr.Servesh, G.S.'' Computer Aided Design Laboratory'' Laxmi Publications, New Delhi – 2016.
2. P.J. Sha '' Engineering Graphics'' S.Chand& Co., New Delhi – 2015.

Reference(s):

1. Dr.M.A.Jayaram, D.S.Rajendra Prasad,'' CAD in Civil Engineering a Laboratory Referrel'' Sapna Book House, Chennai – 2014
2. Shah M G,'' Building Drawing'' Tata McGraw – Hill, New Delhi – 1992.
3. Kumaraswamy N., Kameswara Rao A.'' Building Planning & Drawing'' Charotar Publishing, New Delhi ,2015
4. Shah, Kale and Patki,''Building Drawing with integrated approach to environment'' Tata McGraw – Hill, 2012.

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CO1	1	3		3	2		3		1	3	1			3
CO2		1		1	2	1		1	2				3	2
CO3	2	1		2	1	2	1	2	2	1	2	1	1	1
CO4	2			1	2		1		1		1	2	2	2
CO5		2	1	1	2	3		3	1	2		1	1	2

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K.S.Rangasamy College of Technology – Autonomous								R2018
50 CE 4P2- Material Testing Laboratory								
B.E. Civil Engineering								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
IV	0	0	4	60	2	60	40	100

Objective(s)	• To learn the various test on metal specimen • To gain knowledge on basic properties of concrete making materials • To understand the test on fresh concrete • To learn the behavior of hardened concrete • To acquire knowledge on properties of bitumen and bricks
Course Outcomes	**At the end of the course, the student will be able to** CO1: Express the characteristics of metal specimen CO2: Evaluate the properties of cement, fine aggregate and coarse aggregate CO3: Experiment the properties of fresh concrete CO4: Develop the knowledge on properties of hardened concrete CO5: Demonstrate the test methods of brick and pavement materials

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

1. Determine the maximum shear strength of the mild steel specimen by conducting double-shear test.
2. Determine the impact resistance of mild steel specimen.
3. Determine the hardness number for the given specimen.
4. Conduct the bending test on beam specimen.
5. Conduct the tension test on mild steel rod specimen.
6. Conduct the torsion test on mild steel rod specimen.
7. Determine the properties of cement, fine aggregate and coarse aggregate
8. Determine the workability of concrete (slump cone, compaction factor, Vee bee consistometer and flow table test).
9. Obtain the strength of hardened concrete (compression, split tensile, and flexural strength).
10. Determine the properties of bitumen and bricks.

Total Hours: 60

Course Material

1	Lab manual Prepared by KSRCT – Civil Department.

Reference:

1	IS 383 : 2016 - Coarse and Fine aggregates for Concrete-Specification (Third revision), BIS, New Delhi.
2	IS 12269 : 2013 - Ordinary Portland Cement 53 Grade – Specification BIS, New Delhi.
3	IS 516:1959 - Method of test for strength of Concrete. BIS, New Delhi.
4	IS:1786-2008 - Specification for High strength deformed steel bars and wires for concrete reinforcement. BIS, New Delhi.

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Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	2	1	2	1	1	1	2	2	2	1	3	2
CO2	3	2	3	2	3	2	3	2	2	2	2	1	3	3
CO3	3	2	3	2	3	2	3	2	2	2	2	1	3	2
CO4	3	2	3	2	3	2	3	2	2	2	2	1	3	2
CO5	3	1	2	2	2	2	3	1	2	2	2	1	3	2

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K.S.Rangasamy College of Technology - Autonomous Regulation								R 2018
Semester IV								
Course Code	**Course Name**	**Hours/Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**ES**	**Total**
50 TP 0P2	**Career Competency Development II**	**0**	**0**	**2**	**0**	**100**	**00**	**100**

Course Objectives	• To help the learners to paraphrase the reading passages, to draft continuous writing and review texts in the academic and professional contexts • To help the learners to acquire the phonetic skills of the language and express themselves precisely for effective professional presentations • To help the learners to enrich their verbal reasoning and ability to match the employability requirements of the corporates • To help the learners to comprehend the preliminary level of aptitude skills required to attend placement and competitive online exams • To help the learners to comprehend the Pre - Intermediate level of aptitude skills required to attend placement and competitive online exams
Course Outcomes	**At the end of the course, the student will be able to** 1. Interpret and infer the meaning in the reading passages, organize continuous writing and review texts both academically and professionally. 2. Adapt to and demonstrate the phonetic skills accurately for effective presentations professionally. 3. Interpret the various concepts of verbal reasoning and relate for the concepts to the requirements of the competitive exams and employability 4. Infer the concepts of preliminary level of aptitude skills pertaining to competitive exams and company recruitments. 5. Infer the concepts of pre-intermediate level of aptitude skills pertaining to competitive exams and company recruitments.

Unit – 1	**Written Communication – Part 3**	**Hrs**
Reading Comprehension Level 2 (Paraphrasing Poems) - Letter Drafting - Email Writing - Paragraph Writing - Newspaper and Book Review Writing - Skimming and Scanning - Interpretation of Pictorial Representations. **Practices:** Sentence Completion - Sentence Correction - Jumbled Sentences - Synonyms & Antonyms - Using the Same Word as Different Parts of Speech - Editing **Materials:** Instructor Manual, Word power Made Easy Book, News Papers		6
Unit – 2	**Oral Communication – Part 3**	4
Self-Introduction - Miming (Body Language) - Introduction to the Sounds of English - Vowels, Diphthongs & Consonants, Introduction to Stress and Intonation - Extempore - News Paper and Book Review - Technical Paper Presentation. **Material:** Instructor Manual, News Papers		
Unit – 3	**Verbal Reasoning – Part 1**	8
Analogies - Alphabet Test - Theme Detection - Family Tree - Blood Relations (Identifying relationshipsamong group of people) - Coding & Decoding - Situation Reaction Test - Statement & Conclusions **Material:** Instructor Manual, Verbal Reasoning by R.S.Aggarwal		
Unit – 4	**Quantitative Aptitude – Part 1**	6
Problem on Ages - Percentages - Profit and Loss - Simple & Compound Interest - Averages - Ratio,Proportion **Material:** Instructor Manual, Aptitude Book		
Unit – 5	**Quantitative Aptitude – Part 2**	6
Speed, Time & Work and Distance - Pipes and Cisterns - Mixtures and Allegations - Races - Problemon Trains - Boats and Streams **Practices** : Puzzles, Sudoku, Series Completion, Problem on Numbers **Material:** Instructor Manual, Aptitude Book		
	Total	**30**

Evaluation Criteria

S.No.	Particular	Test Portion	Marks
1	Evaluation 1 - Written Test	15 Questions Each from Unit 1, 3, 4 & 5(External Evaluation)	50

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2	Evaluation 2 - Oral Communication	Extempore & Miming – Unit 2 (External Evaluation by English, MBA Dept.)	30
3	Evaluation 3 - Technical Paper Presentation	Internal Evaluation by the Dept.	20
		Total	**100**

Reference Books

1. Aggarwal, R.S. “A Modern Approach to Verbal and Non-verbal Reasoning”, Revised Edition 2008,Reprint 2009, S.Chand & Co Ltd., New Delhi.
2. Abhijit Guha, “Quantitative Aptitude”, TMH, 3rd edition
3. Objective Instant Arithmetic by M.B. Lal&GoswamiUpkar Publications.
4. Word Power Made Easy by Norman Lewis W.R. GOYAL Publications

Note :

- Instructor can cover the syllabus by Class room activities and Assignments (5 Assignments/week)
- Instructor Manual has Class work questions, Assignment questions and Rough work pages
- Each Assignment has 20 questions from Unit 1, 3, 4 and Unit 5 and 5 questions from Unit 2.
- Evaluation has to be conducted as like Lab Examination.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	1	1	1	1	1	1	1	3	2	3	2	2
CO2		1		1	1	1	1	1	2	3	2	3	1	1
CO3	1	1	1	1	2	3	1	1	2	3	2	3	1	2
CO4	3	2	2	2	1	2	1	1	2	3	2	3	3	3
CO5	3	2	2	2	1	2	1	1	2	3	2	3	3	3

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K.S.Rangasamy College of Technology – Autonomous								R2018
50 CE 501 - Advanced Structural Analysis								
B.E. Civil Engineering								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
V	3	1	0	60	4	50	50	100

Objective(s)	• To learn the plastic analysis of structures • To gain knowledge on the analysis of multistory frames by approximate method. • To Analyse the beams and frames using matrix flexibility method. • To understand the concepts of Analysis using matrix stiffness method. • To learn basics about Finite Element Method
Course Outcomes	**At the end of this course the students will be able to** 1. Examine the indeterminate beams and frames by using plastic theory. 2. Investigate the multi storey frames by approximate methods of Analysis. 3. Analyse the beams and rigid frames using matrix flexibility method. 4. Determine the shear force and bending moment diagrams for the beams and rigid frames using matrix Stiffness method. 5. Apply the finite element method to structural analysis.

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

Plastic Analysis of Structures

Plastic moment of resistance – shape factor – Load factor – plastic hinge and mechanism – plastic analysis of Indeterminate beams and frames (Single bay and single storey) – Applications of upper and lower bound theorems. **[09]**

Approximate Method of Analysis

Introduction - Analysis of multistory frames for gravity and lateral loads by approximate methods- Substitute frame-Portal and cantilever methods**.** **[09]**

Matrix Flexibility Method

Basic concepts of flexibility method: Equilibrium and compatibility equation – Primary structure – compatibility conditions; Analysis of indeterminate structures - continuous beams, rigid jointed plane frames (with redundancy restricted to two) – Shear force and bending moment diagrams**.** **[09]**

Matrix Stiffness Method

Basic concepts of stiffness method: Element and global stiffness matrices – co-ordinate transformations – Rotation matrix – Transformations of stiffness matrices, load vectors and displacements vectors; Analysis of pin – jointed plane frames and rigid frames (with redundancy restricted up to two) – Shear force and bending moment diagrams. **[09]**

Introduction to Finite Element Method

Introduction – Discretisation of a structure – Displacement functions – Truss element – Beam element – Plane stress and plane strain - Triangular elements (Concept Only) **[09]**

Total Hours: 45 + 15(Tutorial) = 60 hours

Text book(s):

1	R Vaidyanadhan and P Perumal, “Comprehensive structural Analysis – Vol.1 & Vol2”, Laxmi Publications, New Delhi, 2016.
2	T S Thandavamoorthy, “Structural Analysis” Oxford University Press, New Delhi, 2011.

Reference(s):

1	S Rajesekaran and G Sankara Subramanian,“Computational structural mechanics” Prentice Hall of India Pvt Ltd, New Delhi, 2004.
2	A Ghali, A M Nebille and T G Brown, “Structural Analysis - A unified classical and Matrix approach” Spon press Ed fifth, London and Newyork, 2009.
3	M K Manickaselvam, “Elements of Matrix And Stability Analysis of Structures”, Khanna Publishers, New Delhi, 2004.
4	S Senthil and Panneerdhass, “Finite Element Analysis” Lakshmi Publications, Chennai, 2017.

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50 CE 501 - Advanced Structural Analysis

List of MAT Lab Programmes

1. Determination of Plastic hinges and moments using MAT Lab
2. Analysis of the building frame structures using MAT Lab
3. Determination of Matrix (nxn) using MAT Lab
4. Determination of Eigen value and Eigen vector by using MAT Lab
5. Determination of stiffness matrix for beams, truss using MAT Lab

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	1	3	2	2	3				3	1	2
CO2	2	1	1	2	2	2	3	3				3	1	2
CO3	1	2	1	2	3	2	2	3				1	1	2
CO4	2	1	1	3	2	2	2	3				3	1	2
CO5	2	1	2	1	2	2	3	3				1	1	2

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K.S.Rangasamy College of Technology – Autonomous								R2018
50 CE 502 - Fundamentals of Reinforced Concrete Design								
B.E.Civil Engineering								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
V	3	1	0	60	4	50	50	100

Objective(s)	• To understand the concept of limit state method • To learn the design methodologies for different structural members • To study the stress strain behavior of steel and concrete • To gain the knowledge of limit state design for flexure, shear, torsion, bond and anchorage • To understanding RC components and structures is attained
Course Outcomes	**At the end of this course the students will be able to** CO1 Illustrate the various design philosophy to be used in the design of structural elements. CO2 Design basic structural element slab using IS code of practice. CO3 Apply the IS code of practice for the design of flexural members. CO4 Gain the knowledge on limit state design for shear, torsion, bond and anchorage. CO5 Identify and apply the applicable IS code of practice for the design of columns and footings.

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

Design Philosophy

Introduction - Grades of concrete and steel - Concept of Elastic method, ultimate load method and limit state method – Advantages of Limit State method over other methods - Limit State philosophy as detailed in IS 456-2000 code – Load and Load combinations – characteristic strength and design strength of materials, characteristic loads and design loads - Partial safety factor. **[09]**

Limit State Design of Slab

Behavior of one way and two way slab - Design of one way simply supported and continuous slab - Design of Two way rectangular slab subjected to uniformly distributed load for various boundary conditions using IS code coefficients – reinforcement detailing - curtailment of reinforcement. - Design of cantilever slab. **[09]**

Limit State Design for Flexure

Analysis and design of Singly reinforced beams, doubly reinforced beams and Flanged beams (T and L beams). **[09]**

Limit State Design for Bond, Anchorage, Shear & Torsion

Behaviour of RC members in bond and anchorage – Design requirements – Behaviour and design of RC beams in shear – Design of RC members for combined bending, shear and torsion. Design for development length and end anchorages – reinforcement detailing. **[09]**

Limit State Design of Columns and Footings

Basic concepts of compression members - Classification of columns – Design of short RC column for axial, uniaxial and biaxial bending. - Types of footing - Design of Isolated square and rectangular footing - Combined Rectangular footing for two columns only. **[09]**

Total Hours: 45 + 15(Tutorial) = 60 hours

Text book(s):

1	Krishna Raju, N., “Design of Reinforced Concrete Structures”, CBS Publishers & Distributors, ND 2016.
2	Unnikrishna Pillai, S., Devadas Menon, “Reinforced Concrete Design”, Tata McGraw-Hill Publishing Company Ltd., New Delhi. 2017.

Reference(s):

1	N. Subramanian, Design of Reinforced Concrete Structures, Oxford University Press, New Delhi, 2014.
2	B.C. Punmia. Ashok K. Jain and Arun K. Jain, RCC Designs (Reinforced Concrete Structures), Lakshmi Publications (P) Ltd., New Delhi, Ninth Edition, 2012.
3	Edward G. Nawy, Reinforced Concrete – A fundamental Approach, 6th Edition, Prentice Hall, 2008.
4	IS 456 - 2000 “Code of practice for Plain and Reinforced concrete”, BIS New Delhi.

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50 CE 502 - Fundamentals of Reinforced Concrete Design

List of MAT Lab Programmes

1. Introduction to MAT Lab
2. Design of Slab using MAT Lab
3. Design of Beam using MAT Lab
4. Design of Shear reinforcement using MAT Lab
5. Design of Column using MAT Lab

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1					3				3	3	2
CO2	2	3	1					3				3	3	2
CO3	2	3	1					3				3	3	2
CO4	2	3	1					3				3	3	2
CO5	2	3	1					3				3	3	2

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K.S.Rangasamy College of Technology – Autonomous								R2018
50 CE 503 - Wastewater Engineering								
B.E. Civil Engineering								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
V	3	0	0	45	3	50	50	100

Objective(s)	• To study the waste water sources and characteristics. • To develop various waste water treatment process. • To provide an experience in the implementation of engineering concepts which are applied in the field of waste Water treatment process. • To recognize the treatment of wastewater including the estimation of waste water. • To identify the design principles involved in treatment of waste water
Course Outcomes	**At the end of this course the students will be able to** CO1 Compute the quantity and characteristics of wastewater. CO2 Express the Hydraulic design and construction of sewers CO3 Relate the design principles of unit operations and processes for wastewater treatment CO4 Explain the Biological treatment process and biomass growth kinetics CO5 Discuss the sludge disposal methods and house drainage connection

Note: The hours given against each topic are of indicative. The faculty has the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

Sewage and Sewerage System

Importance and scope of waste water Engineering – systems of sanitation - Sources of waste water - estimation of storm runoff by rational and empirical formula – factors affecting storm water drainage – time of concentration - quantity of sewage – Characteristics of sewage – decomposition of sewage - aerobic and anaerobic decomposition – carbon, nitrogen, sulphur cycles – BOD and their testing – population equivalent relative stability. **[09]**

Hydraulic Design and Construction of Sewers

Hydraulics of sewer flow – forces acting on sewers – sewer materials – design of sewers – section of sewers - shape of sewers – construction of sewers – laying jointing and testing of sewers – sewers appurtenances - pumping of sewage – types of pumps - cleaning of sewers – ventilation of sewers. **[09]**

Preliminary and Primary Treatment

Objectives – Unit operations and processes–principles and design of preliminary treatments – screens, skimming tanks, grit chamber and primary sedimentation tanks – types – Design of sedimentation tanks – sedimentation aided with coagulation and sludge solids. **[09]**

Secondary Treatment

Objectives of secondary treatment – Aerobic, Anaerobic and facultative systems. Suspended growth process – Attached growth process – Operation and design of conventional activated sludge process – Types of aeration – Mechanical Aerators - Trickling filters – Types – Stabilization ponds – Septic tanks – Oxidation pond – Oxidation ditch – Modified activated sludge process –. Advanced waste water treatment systems- Anaerobic filters – UASB reactor. **[09]**

Sewage Disposal and Rural Sanitation

Sludge disposal – Methods – Dilution – Self-purification of surface water bodies – Streeter Phelps equation – Oxygen sag curve and stages of self-purification – Disposal on land – Sewage farming – Sewage sickness – Sludge characteristics – Thickening, Conditioning, Dewatering – Sludge digestion – Biogas recovery. Sanitary fittings – One pipe and two pipe systems – General layout of house service connection – Rural sanitation systems. **[09]**

Total Hours: 45 hours

Text book(s):

1	Garg S.K., "Environmental Engineering Vol II". Khanna Publishers, New Delhi. Reprint Edition 2011.
2	Punmia B.C,"Waste water Engineering Vol II", Laxmi Publications, Reprint Edition Aug 2013.

Reference(s):

1	Metcalf and Eddy, Inc. "Waste water Engineering Treatment, Disposal and Reuse" 3rd Edn, McGraw Hill Book Co. New York 2003
2	Manual on sewage and sewerage Treatment, CPHEEO, Ministry of Urban Development, Government of India, ND, 2009.
3	Standard Methods for the Examination of Water and Wastewater, American Public Health Association, 20th Edition 2015..
4	Rangwala, "Water Supply Engineering and Sanitary Engineering", Charotar Publishing House Pvt. Ltd., 2012

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1			2	1	2		2	3	2		2
CO2	2		1	2	3	3	2	2		2		1	1	3
CO3		1			2	1		3		3		2	1	3
CO4	1		2				3				3	2	2	2
CO5	2		1		2	1	1	1	3	2		3		3

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K.S.Rangasamy College of Technology – Autonomous								R2018
51 CE 504 – Foundation Engineering								
B.E. Civil Engineering								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
V	3	1	0	60	4	50	50	100

Objective(s)	• To provide an exposure to the site investigation and bore-log report. • To impart knowledge in the selection of sites for investigate • To determine the soil condition and provide the suitable foundation. • To design the pile foundation based on capacity of super structure. • To evaluate the problems for retaining structures.
Course Outcomes	**At the end of this course the students will be able to** 1. State the knowledge on site investigation and soil exploration. 2. Apply the concepts of bearing capacity of shallow foundations in homogeneous deposits. 3. Classify the footings and calculate the contact pressure distribution below footings. 4. Evaluate the concepts in load carrying capacity of piles, negative skin friction, pile groups and under reamed pile foundations. 5. Review the knowledge of plastic equilibrium in soils and Rankines theory on cohesion less and cohesive soil.

Note: The hours given against each topic are of indicative. The faculty has the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

Site Investigation and Selection of Foundation

Scope and objectives of soil exploration– Methods of exploration – Depth of exploration –spacing and Number of bore holes – Sampling – Sampling techniques –Disturbed and undisturbed samples –Types of samples - Split spoon sampler – Thin walled sample-Bore log Report – data interpretation – strength parameters – selection of foundation based on soil condition. **[09]**

Shallow Foundation

Types of foundation – location and depth –bearing capacity: factors affecting bearing capacity – bearing capacity of shallow foundation on homogenous soil: Terzaghi and BIS formulae; Bearing capacity from In-situ tests: PLT-SPT-SCPT; Allowable bearing pressure; settlement: types - determination of settlement on granular and clay deposits – total and differential settlement - minimizing the total and differential settlement. **[09]**

Footings and Rafts

Types of Footings – Contact pressure distribution; Types and proportioning: Isolated - Combined footings (for two columns only foundations; Floating foundation) – Raft and Mat. **[09]**

Pile Foundation

Introduction to Piles -Classifications of piles; load carrying capacity of single pile in granular and cohesive soils: static and dynamic formulae; Pile group: efficiency of pile groups - settlement of pile group; Pile test: In-situ penetration tests – pile load tests; under reamed pile – pile capacity under uplift. Design of Pilecap **[09]**

Retaining Walls

Introduction-Plastic equilibrium in soils – Active and passive states – Rankine's theory – Cohesion less and cohesive soil – Coloumb's wedge theory – Earth pressure on retaining walls of simple configurations – Pressure on the wall due to line load – Stability of retaining walls – active and passive earth pressure by graphical methods – Culman's methods – Rehbann's methods-Geomembrane. **[09]**

Total Hours: 45 + 15(Tutorial) = 60 hours

Text book(s):

1	Gopala Ranjan, ASR Rao," Basic and applied soil mechanics", New Age International Publishers, ND, 2015.
2	Venkatramaiah, C. "Geotechnical Engineering", New Age International Publishers, New Delhi, 2017.

Reference(s):

1	Das, B.M."Principles of Foundation Engineering (Fifth edition), Thomson Books / COLE, 2012.
2	Punmia, B.C., "Soil Mechanics and Foundations", Laxmi publications pvt.Ltd. New Delhi, 2015.
3	Murthy, V.N.S, "Soil Mechanics and Foundation Engineering", UBS Publishers Distribution Ltd, ND, 2011.
4	McCarthy D.F., "Essentials of Soil Mechanics & Foundations", Prentice-Hall, 2002

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51 CE 504 – Foundation Engineering

List of MAT Lab Exercises

1. Introduction to MAT Lab
2. Prediction of Bearing Capacity using MAT Lab
3. MATLAB Modeling of SPT and Grain Size Data in Producing Soil Profile
4. In Mining Ensure safety and avoid costly consequences of geotechnical instability through focused studies, operational support, and risk management using MAT Lab
5. Pile Foundation Analysis for layered soil using MAT Lab

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	1	2	3		2	1	1	2			3	2
CO2	1	2	1	1	1	3		1				2	3	2
CO3	2	2	3			1	2	2	1		1		3	2
CO4	1		2		3		1	2	3	1		1	3	2
CO5	2	2		1	3	2		2		3			3	2

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K.S.Rangasamy College of Technology – Autonomous								R2018
51 CE 5P1 - Environmental Engineering Laboratory								
B.E. Civil Engineering								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
V	0	0	4	60	2	60	40	100

Objective(s)	• To examine the analysis of water and waste water quality parameters. • To identify the sampling and significance of characterization of wastewater. • To study about the air pollution equipment. • To learn the biological analysis of water and wastewater. • To impart students with strong knowledge on analysis of water and waste water
Course Outcomes	**At the end of this course the students will be able to** **CO1** Estimate the physical impurities present in the water/waste water **CO2** Compute the chemical parameters present in the water/waste water **CO3** Determine the available Chlorine in Bleaching powder **CO4** Calculate the optimum coagulant dosage for the removal of solids **CO5** Analyse the BOD/COD in wastewater

Note: The hours given against each topic are of indicative. The faculties have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

1. ANALYSIS OF WATER QUALITY PARAMETERS

- Determination of pH
- Determination of Turbidity
- Determination of Hardness
- Estimation of Chlorides
- Estimation of Sulphates
- Estimation of Iron
- Determination of Available Chlorine in Bleaching powder
- Determination of Optimum coagulant dose
- Determination of sodium and potassium
- Determination of fluorides
- Determination of solids in water
- Determination of DO

2. ANALYSIS OF WASTEWATER CHARACTERISTICS

- Determination of solids in wastewater
- BOD of waste water
- Determination of COD
- Determination of Nitrates.(Determination of Total Nitrogen)

Total Hours: 60

Course Material:

1. Lab manual Prepared by KSRCT – Civil Department.
2. Standard Methods for the examination of water and wastewater, 23rd Edition 2017.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1			1	2				2	3				2
CO2	2	2				1			2		3			2
CO3		1		2			2			2				3
CO4	1		2		3				3					3
CO5	2	3		2	1			2	1			3	1	

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K.S.Rangasamy College of Technology – Autonomous								R2018
50CE 5P2- Geotechnical Engineering Laboratory								
B.E.Civil Engineering								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
V	0	0	4	60	2	60	40	100

Objective(s)	• To acquire knowledge on index properties of soils. • To determine engineering properties of the soils. • To Provide field in-situ test for cohesive soil • To know the settlement of foundation by consolidation test • To understand the California Bearing ratio test.
Course Outcomes	**At the end of this course the students will be able to** 1. List the basic concepts and the properties of soil. 2. Classify the soils by sieve analysis, hydrometer method and specific gravity. 3. Apply the knowledge of science and techniques in engineering properties of soil. 4. Identify to design and conduct experiments to analyze critically and interpret resulting data related to various engineering properties of soil. 5. Evaluate the impact of field density of soil and California Bearing Ratio Test

Note: The hours given against each topic are of indicative. The faculty has the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

LIST OF EXPERIMENTS

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

2. DETERMINATION OF INSITU DENSITY AND COMPACTION CHARACTERISTICS
a. Field density Test (Sand replacement method)
b. Determination of moisture – density relationship using standard Proctor compaction test.
c. Semi Solid Composite Characteristics

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

Total Hours: 60

Course Material:

1	Lab manual Prepared by KSRCT – Civil Department.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO39	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	2	2	2		2		3	1		3	3	2
CO2	1	1		2	2	2	2	2	2			1	3	2
CO3	2	2	3	2	2	2	1				1		3	2
CO4	1		2	3	3				2		2		3	2
CO5	2	1		3	2			1	3	3			3	2

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K.S.Rangasamy College of Technology - Autonomous Regulation								R 2018
Semester V								
Course Code	**Course Name**	**Hours/Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**ES**	**Total**
50 TP 0P3	**CAREER COMPETENCY DEVELOPMENT III**	**0**	**0**	**2**	**0**	**100**	**00**	**100**

Course Objectives	• To help the learners to enrich the written and oral communication skills in the academic and professional contexts • To help the learners to enrich their verbal and logical reasoning ability to meet out the employability requirements of the companies • To help the learners to comprehend the Intermediate level of aptitude skills required to attend placement and competitive online exams • To help the learners to enhance their knowledge in the quantitative aptitude skills in algebraic and linear equations. • To help the learners to augment the core technical and coding skills of their respective domains to compete in coding contests
Course Outcomes	**At the end of the course, the student will be able to** 1. Examine the written and oral communication skills in the academic and professional contexts 2. Interpret the concepts of verbal reasoning and relate for the concepts to the requirements of the competitive exams and employability 3. Infer the concepts of intermediate level of aptitude skills pertaining to competitive exams and company recruitments. 4. Assess their comprehension in the quantitative aptitude skills in algebraic and linear equations. 5. Review the core technical and coding skills of their respective domains to compete in coding contests

Unit – 1	Written and Oral Communication – Part 1	Hrs
Reading Comprehension Level 3 - Self Introduction - News Paper Review - Self Marketing - Debate- Structured and Unstructured GDs Psychometric Assessment – Types & Strategies to answer the questions **Practices:** Sentence Completion - Sentence Correction - Jumbled Sentences - Synonyms & Antonyms - Using the Same Word as Different Parts of Speech - Interpretation of Pictorial Representations - Editing - GD - Debate. **Materials:** Instructor Manual, Word power Made Easy Book, News Papers		6
Unit – 2	Verbal & Logical Reasoning – Part 1	8
Syllogism - Assertion and Reasons - Statements and Assumptions - Identifying Valid Inferences - identifying Strong Arguments and Weak Arguments - Statements and Conclusions - Cause and Effect - Deriving Conclusions from Passages - Seating Arrangements. **Practices:** Analogies - Blood Relations - Statement & Conclusions. **Materials:** Instructor Manual, Verbal Reasoning by R.S.Aggarwal		
Unit – 3	Quantitative Aptitude – Part 3	6
Probability - Calendar- Clocks - Logarithms - Permutations and Combinations **Materials:** Instructor Manual, Aptitude Book		
Unit – 4	Quantitative Aptitude – Part 4	6
Algebra - Linear Equations - Quadratic Equations – Polynomials. **Practices:** Problem on Numbers - Ages - Train - Time and Work - Sudoku – Puzzles. **Materials:** Instructor Manual, Aptitude Book		
Unit – 5	Technical & Programming Skills – Part 1	4
Core Subject – 1,2 3 **Practices:** Questions from Gate Material. **Materials:** Text Book, Gate Material		
	Total	30

Evaluation Criteria

S.No.	Particular	Test Portion	Marks
1	Evaluation 1 Written Test	15 Questions each from Unit 1, 2, 3, 4 & 5 (External Evaluation)	50
2	Evaluation 2 - Oral Communication	GD and Debate (External Evaluation by English, MBA Dept & External Trainers)	30
3	Evaluation 3 – Technical Paper Presentation	Internal Evaluation by the Dept.	20
		Total	**100**

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Reference Books

1. Aggarwal, R.S. “A Modern Approach to Verbal and Non-verbal Reasoning”, Revised Edition 2008, Reprint 2009, S.Chand & Co Ltd., New Delhi.
2. Abhijit Guha, “Quantitative Aptitude”, TMH, 3rd edition
3. Objective Instant Arithmetic by M.B. Lal & GoswamiUpkar Publications.
4. Word Power Made Easy by Norman Lewis W.R. GOYAL Publications

Note :

- Instructor can cover the syllabus by Class room activities and Assignments (5 Assignments/week)
- Instructor Manual has Class work questions, Assignment questions and Rough work pages
- Each Assignment has 20 Questions from Unit 1,2,3,4 and 5 and 5 Questions from Unit 1
- Evaluation has to be conducted as like Lab Examination.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	1	1	1	1	1	2	3	2	3	1	1
CO2	2	1	2	2	1	2	1	1	2	3	3	3	2	2
CO3	2	1	2	2	1	1	1	1	2	3	2	3	2	2
CO4	2	1	2	2	1	1	1	1	2	3	2	3	2	2
CO5	2	2	2	2	2	2	2	2	2	3	2	3	3	3

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K.S.Rangasamy College of Technology – Autonomous								R2018
50 CE 601 - Advanced Reinforced Concrete Design								
B.E. Civil Engineering								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VI	3	1	0	60	4	50	50	100

Objective(s)	• To understand the design concept of various structures and detailing of reinforcements • To Understand the basic concepts and behavior of continuous flexural members • To bring about an exposure to advanced topics in structural design comprising of RCC retaining walls, water tanks and Flat slabs. • To study the design of staircases • To gain design knowledge related to structures, systems that are likely to be encountered in professional practice
Course Outcomes	**At the end of this course the students will be able to** CO1 Apply the concept of moment redistribution in design of continuous flexural members. CO2 Design interior and exterior panels of flat slab. CO3 Identify the suitable retaining wall and design cantilever, counter fort retaining wall CO4 Design and detail the stair case, RCC wall and Deep beam. CO5 Design various types of liquid storage structures as per Indian standard codal provision.

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

Design of Continuous Flexural Members
Concept of moment redistribution- Live load arrangements - Design of Continuous beams and slab. **[09]**

Design of Flat Slabs
Flat slab- Types and components – Design of interior and exterior panels. **[09]**

Retaining Wall
Retaining wall- Types – Components- Forces and Stability requirements- Design of cantilever and counter fort retaining walls**.** **[09]**

Advanced topics
Design of staircases (ordinary and doglegged) – Design of reinforced concrete walls- Design of deep beams. **[09]**

Water Tank
Water tank- Classification- Design of circular and rectangular water tank- resting on ground and underground. **[09]**

Total Hours: 45 + 15(Tutorial) = 60 hours

Text book(s):

1	Gambhir.M. L, “Design of Reinforced Concrete Structures”, Prentice Hall of India, Ed Fourth, 2012.
2	N Krishna Raju and R.N. Pranesh, “Design of Reinforced Concrete Structures”, New Age International Ed First,2018.

Reference(s):

1	Ramamrutham S, Design of Reinforced Concrete Structures, Dhanpat Rai Ed Seventeenth , 2016
2	Dayaratnam, P, “Design of Reinforced Concrete Structures”, Oxford & IBH Publishers Ed first, 2005.
3	C.Syal and A.K.Goel, “Reinforced Concrete Structures”, S.Chand and Company Ed Fourth, 2012.
4	Edward G. Nawy, “Reinforced Concrete – A fundamental Approach”, Prentice Hall Ed Sixth, 2008.

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50 CE 601 – ADVANCED REINFORCED CONCRETE DESIGN

List of MAT Lab Programmes

1. Introduction to MAT Lab
2. Design of Continuous beams using MAT Lab
3. Design of flat slabs using MAT Lab
4. Design of staircase using MAT Lab
5. Design of water tanks using MAT Lab

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1		3					3				3	1	
CO2	1	2	3					3				3	1	1
CO3	1	2	3					3				3	1	2
CO4	1		3					3				3	1	2
CO5	1	2	3					3				3	1	

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TIRUCHENGODE - 637 215

K.S.Rangasamy College of Technology – Autonomous								R2018
50 CE 602 - DESIGN OF STEEL STRUCTURES								
B.E. Civil Engineering								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VI	3	1	0	60	4	50	50	100

Objective(s)	• To Understand the basic concepts of limit state design of structural members • To Design bolted and welded connections • To Learn the design of compression members & tension members • To understand the concept of lateral buckling and design various elements like gantry girder, plate girder and beam- column. • To understand the Design of purlin and elements of truss.
Course Outcomes	**At the end of this course the students will be able to** 1. Identify the concepts of bearing & friction type bolted connections and welded connections 2. Illustrate the design of tension members 3. Design the compression members and base plates 4. Outline the design concepts of laterally supported and laterally unsupported beams 5. Analyze the different types of truss for the calculated loads

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated

.**INTRODUCTION**

Properties of steel – Structural steel sections – Limit State Design Concepts – Loads on Structures –Connections using rivets, welding, bolting – Design of bolted and welded joints – Eccentric connections – Efficiency of joints. **[09]**

TENSION MEMBERS

Types of sections – Net area – Net effective sections for angles and Tee in tension – Design of connections in tension members – Use of lug angles – Design of tension splice – Concept of shear lag **[09]**

COMPRESSION MEMBERS

Types of compression members – Basis of current codal provision for compression member design – Slenderness ratio – Design of single section and compound section compression members – Design of laced and battened type columns – Design of column bases – Gusseted base. **[09]**

BEAMS

Design of laterally supported and unsupported beams – Built up beams – Beams subjected to uniaxial and biaxial bending – Design of plate girders – Intermediate and bearing stiffeners – Flange and web splices. **[09]**

ROOF TRUSSES AND INDUSTRIAL STRUCTURES

Roof trusses – Roof and side coverings – Design of purlin and elements of truss; end bearing – Design of gantry girder. **[09]**

Total Hours: 45 + 15(Tutorial) = 60 hours

Text book(s):

1	Subramaniam.N. “Design of Steel Structures “,(As per IS 800-2007), Oxford University Press, 2012.
2	Bhavikatti SS, “Design of Steel Structures”, I.K.International Publishing House Pvt. Ltd 2012

Reference(s):

1	Duggal S K.,’’Limit State Design of Steel Structures”, Tata McGraw Hill, New Delhi, 2012.
2	Teaching Resources for Structural Steel Design, INSDAG, Kolkata, 2010.
3	IS 800 – 2007, “Code of Practice for General Construction in steel”, BIS, New Delhi.
4	Sairam K.S “Design of Steel Structures” ,Pearson Publication, 2013

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50 CE 602 - DESIGN OF STEEL STRUCTURES

List of MAT Lab Programmes

1. Introduction to MAT Lab
2. Design of connections in tension members using MAT lab
3. Design of column bases using MAT lab
4. Design of plate girders using MAT lab
5. Design of gantry girder using MAT lab

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO 2
CO1	2	2	3	3	3	2	2	3	3	3	3	1	2	3
CO2	3	2	3	2	2	3	2	3	2		1		3	3
CO3	2	2	2	2	2	3	2	2	2	1		1	2	2
CO4	2	2	3	2	2	2	3	3	2	1		3	2	3
CO5	3	3	2	3	3	3	2	2	3	2	3	1	2	2

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K.S.Rangasamy College of Technology – Autonomous								R2018
50 CE 603 - Hydrology and Water Resources Engineering								
B.E. Civil Engineering								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VI	3	0	0	45	3	50	50	100
Objective(s)	• To develop basic understanding about precipitation, infiltration, evapotranspiration, • To learn the concepts of hydrograph and groundwater hydraulics. • To gain knowledge on various irrigation methods and water requirements. • To create understanding about features of various types of dams and reservoirs. • To study the essentials about flood and drought management.							
Course Outcomes	**At the end of this course the students will be able to** CO1: Demonstrate various components of hydrologic cycle. CO2: Analyze the hydrograph and groundwater hydraulics. CO3: Summarize the irrigation methods and crop water requirements. CO4: Explain the types of reservoirs and dam elements. CO5: Outline the flood and drought management techniques.							

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

Precipitation

Introduction, Hydrologic cycle, Climate and water availability, Water balances, Precipitation: Forms, Classification, Variability, Measurement, Data analysis, Evaporation and its measurement, Evapotranspiration and its measurement, Penman Monteith method, Infiltration: Factors affecting infiltration, Horton's equation and Green Ampt method. **[09]**

Hydrograph and Groundwater Hydraulics

Hyetograph, Runoff: drainage basin characteristics, Hydrograph concepts, assumptions and limitations of unit hydrograph, Derivation of unit hydrograph, S- hydrograph, Flow duration curve, Groundwater: Occurrence, Darcy's law, Well hydraulics, Well losses, Yield, Pumping and recuperation test, Sea water intrusion. **[09]**

Irrigation Methods

Definition, Advantages and Necessity, Methods of Irrigation, Surface Irrigation, Subsurface Irrigation, Micro-Irrigation, Soil moisture and Crop water relationship, Factors governing Consumptive use of water, Principal Indian crops, their season and water requirement – duty, delta, irrigation efficiency. **[09]**

Reservoirs and Dams

Types, Investigations, Site selection, Zones of storage, Safe yield, Reservoir capacity, Reservoir sedimentation and control. Introduction to Dams, types of dams, spillways and ancillary works, Site assessment and selection of type of dam, Information about major dams and reservoirs of India. **[09]**

Flood and Drought Management

Definition and causes of floods and droughts – Design flood, Flood estimation, frequency analysis – flood control measures – drought indices - drought prone area programme – artificial recharge – rain water harvesting. **[09]**

Total Hours: 45

Text book(s):

1	P.N. Modi, "Irrigation Water Resources and Water Power Engineering", Standard Book House, New Delhi, 2019.
2	B.C. Punmia, P.B.B. Lal, A.K. Jain and A.K. Jain, "Irrigation and Water Power Engineering", Standard Publishers, 2019.

Reference(s):

1	K. Subramanya, "Engineering Hydrology", Tata McGraw Hill Pub. Co., New Delhi, 2016.
2	R.K. Sharma and T.K. Sharma, "Text Book of Hydrology and Water Resources Engineering", Dhanpat Rai Publications, New Delhi, 2002.
3	R.K. Linsley and J.B. Franzini, "Water Resources Engineering", McGraw Hill, New York, 2001.
4	H M Raghunath, "Hydrology : Principles, Analysis and Design", New Age International, 2015.

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COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	1	1		1	2			1			2	1
CO2	3	2	1	2		1	2			1			2	2
CO3	3	1				1				1			1	1
CO4	3	1				1	1			1			1	1
CO5	3	2	1	2		1	2			1			1	2

K.S.Rangasamy College of Technology – Autonomous								R2018
50 CE 604 - Highway and Railway Engineering								
B.E. Civil Engineering								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VI	3	0	0	45	3	50	50	100

Objective(s)	• To Gain knowledge about planning, design, construction of highways and railways. • To study the essentials materials used in Highways and Railways • To understand the basic concepts of pavement management system, evaluation of distress and maintenance of pavements. • To Learn the design of Track- Train Dynamics • To acquire knowledge of site investigation for location and planning of highways and railways.
Course Outcomes	**At the end of this course the students will be able to** CO1: Describe the Engineering survey and highway Geometric Design CO2: Select the suitable highway materials and pavements. CO3: Explain the importance of highway construction and maintenance works. CO4: Infer the importance of railways and the functions of ballast and sleepers CO5: Express the principles of signaling and the layouts of railway station and yards

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

Highway Planning and Geometric Design **[09]**

History of road development in India - Classification of highways – Engineering surveys for alignment - Highway geometrics and their standards: width of element, camber – Horizontal curves - Super elevation , transition curves – Widening of pavements - Sight distances - Vertical curves – Gradients.

Highway Materials and Design of Pavements **[09]**

Highway materials, their requirements and testing-Design principles- Pavement components and their role - Factors affecting the design of pavements - Design practice for flexible pavement - CBR and IRC method - Rigid pavements - IRC recommendations..

Highway Construction Practice and Maintenance **[09]**

Construction practice: Water bound macadam road, Bituminous road and Concrete road – Modern materials and methods of construction - Highway drainage – Special considerations for hill roads – Highway project formulation - Pavement distress in flexible and rigid pavements - Pavement evaluation by deflection measurements – Strengthening of pavements – Highway maintenance – Over lay design by Benkelman Beam method (procedure only) – Plastic Roads.

Railways Planning **[09]**

Role of Indian Railways in National Development – Private railway coaches in India - Permanent way: components and Functions; Rails: Types, rail fastenings, Rail joints; Gauges, Coning of wheels, creeps and kinks; Sleepers: Function, Materials, Density; Ballasts: Function, materials.

Railway Track Operation **[09]**

Working Principle of Signaling, interlocking and Track Circuiting - Layouts of railway station and yards – Rolling stock, Tractive power, Track Resistance, Level Crossing, Underground Railways.

Total Hours: 45

Text book(s):

1	Khanna, S.K and Justo, C.E.G., “Highway Engineering”, Nem Chand and Brothers, 2019.
2	Arora, S.P and Saxena, S.C., “A text book of Railway Engineering “, Dhanpat Rai and Sons, 2014.

Reference(s):

1	Kadiyali, L.R, and Lal,N.B., “Principles and Practice of Highway Engineering”, Khanna Technical Publications, 2014.
2	Subramanian, K.P., “Transportation Engineering”, Scitech Publishers, 2018.
3	Mundrey, J.S., “Railway Track Engineering”, Tata Mcgraw Hill Publishing Co Ltd, 2013.
4	Beverly T. Kuhn., “Transportation Engineering: A Practical Approach to Highway Design, Traffic Analysis, and Systems Operations”, Tata Mc Graw Hill, 2019.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	3		2	1			2		2	1			2
CO2	1		2			2	1		3	3	1	2	3	
CO3		1		3				2		2			3	3
CO4	2		2	2	1	2	3		1	2	3	3		
CO5	3	1		1	2	1	1	3	1	1	1	3	1	1

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K.S.Rangasamy College of Technology – Autonomous								R2018
50 CE 6P1 - Computer Aided Analysis and Design Laboratory								
B.E. Civil Engineering								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VI	0	0	4	60	2	60	40	100

Objective(s)	• To learn software packages for performing analysis of structures • To learn software packages for performing design of structures • To analyse and design concrete structures using software packages • To analyse and design steel structures using software packages • To know the design concepts of different structural elements by using excel sheet.
Course Outcomes	**At the end of this course the students will be able to** CO1: Practice software packages for analysis and design CO2: Learn to analyse a beam for various load combinations CO3: Analyse and design of 2D RCC and Steel structures CO4: Perform analysis and design of 3D RCC and steel structures CO5: Prepare excel sheet for design of structural elements

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

ANALYSIS

Multi – storey 2D and 3D frame analysis for various loads and load combinations using software package

DESIGN

a) Design of reinforced concrete slabs, beams, columns, and footing using software package
b) Design of Trusses, steel beams and columns using software package
c) Application of Excel spread sheet for the design of structural elements

Total Hours: 60

References

1	Krishnaraju N., “Structural Design and Drawing”, Orient Longman Publishers, NewDelhi, 2013.
2	Unnikrishna Pillai, S., Devadas Menon, “Reinforced Concrete Design”, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2010.
3	Subramaniam.N, “Design of Steel Structures “,(As per IS 800-2007) Ist Edition, oxford university press, 2010.
4	IS 456 - 2000 “Code of practice for Plain and Reinforced concrete”, BIS New Delhi.
5	IS 800 – 2007, “Code of Practice for General Construction in steel”, BIS, New Delhi.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	1	1	1	3	3	3	1	3	3
CO2	3	3	3	3	3		1		2	2	2	1	3	2
CO3	3	3	3	3	3	2	1	1	3	3	3	1	3	3
CO4	3	3	3	3	3	2	1	1	3	3	3	1	3	3
CO5	3	3	3	3	1	1	1		2	1	2	1	3	2

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K.S.Rangasamy College of Technology – Autonomous								R2018
50 CE 6P2 - Irrigation Engineering Design and Drawing Laboratory								
B.E. Civil Engineering								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VI	0	0	4	60	2	60	40	100

Objective(s)	• To understand the purpose and concepts of weirs and sluices. • To learn the cross sectional details of siphon, drop and regulators. • To study the planning details about aqueduct and river diversion works. • To design the components of various irrigation structural elements. • To draw the structures in detail by showing the plan, elevation and sections.
Course Outcomes	**At the end of this course the students will be able to** CO1: Design and draw the components of surplus weir. CO2: Explain the design principles of sluices. CO3: Develop the design parameters for siphon and aqueduct. CO4: Plan and draw the section and elevation of canal drop & regulator. CO5: Outline the layout of river diversion works.

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

Design and Drawing of

1. Surplus Weir
2. Tank Sluice – Tower Head
3. Direct Sluice – Wing Wall type
4. Syphon
5. Canal Drop (Notch Type)
6. Canal Regulator
7. Syphon Aqueduct
8. Layout of river diversion works

Total Hours: 60

Text Books

1	Garg, S. K, "Irrigation Engineering and Hydraulic Structures", Khanna Publishers, New Delhi, 2018.
2	N.N Basak, "Irrigation Engineering", Tata McGraw- Hill Publishing Co. 2007.

References

1	Satyanarayana Murthy, "Irrigation Design and Drawing", Published by Mrs. L. Banumathi, Tuni, East Godavari District, A.P, 2002.
2	Asawa, G.L, "Irrigation Engineering", New Age International Publishers, 2nd edition, 2005.
3	Sharma R.K, and Sharma T.K, "Irrigation Engineering", S. Chand and company, New Delhi, 2002.
4	H.M Raghunath, Irrigation Engineering, Wiley India Pvt. Ltd., New Delhi, 2011.

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Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	2	2	2	2	2	3	2	3	2
CO2	3	3	3	3	2	2	1	1	1	1	1	2	3	2
CO3	3	3	3	3	2	2	1	1	1	1	1	2	3	2
CO4	3	3	3	3	2	2	2	2	2	2	3	2	3	2
CO5	3	2	2	2	2	2	2	2	1	2	2	1	3	2

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K.S.Rangasamy College of Technology – Autonomous Regulation								R 2018
Semester VI								
Course Code	**Course Name**	**Hours/Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**ES**	**Total**
50 TP 0P4	**CAREER COMPETENCY DEVELOPMENT IV**	**0**	**0**	**2**	**0**	**100**	**00**	**100**

Course Objectives	• To help the learners to enrich the advanced written and oral communication skills in the academic and professional contexts • To help the learners to augment their advanced verbal and logical reasoning ability to meet out the employability requirements of the companies • To help the learners to comprehend the advanced level of aptitude skills in the concepts of Geometry • To help the learners to enhance the data interpretation and analytical skills in varied methods. • To help the learners to enrich the technical and programming skills to be focused on better employability, codeathons and hackathons
Course Outcomes	**At the end of the course, the student will be able to** 1. Examine and correlate the written and oral communication skills in the academic and professional contexts 2. Predict and discriminate advanced verbal and logical reasoning ability to meet out the employability requirements of the companies 3. Infer the concepts of advanced level of aptitude skills on Geometry pertaining to competitive exams and company recruitments. 4. Illustrate the data interpretation and analytical skills in varied methods. 5. Formulate the technical and programming skills to be focused on better employability, codeathons and hackathons

Unit – 1	Written and Oral Communication – Part 2	Hrs
Self-Introduction – GD – Personal Interview Skills **Practices** on Reading Comprehension Level 2 – Paragraph Writing – Newspaper and Book Review Writing – Skimming and Scanning – Interpretation of Pictorial Representations – Sentence Completion- Sentence Correction – Jumbled Sentences – Synonyms & Antonyms – Using the Same Word as Different Parts of Speech – Editing. **Materials:** Instructor Manual, Word power Made Easy Book, News Papers		4
Unit – 2	Verbal & Logical Reasoning – Part 2	8
Analogies – Blood Relations – Seating Arrangements – Syllogism – Statements and Conclusions, Cause and Effect – Deriving Conclusions from Passages – Series Completion (Numbers, Alphabets & Figures) – Analytical Reasoning – Classification – Critical Reasoning **Practices**: Analogies – Blood Relations – Statement & Conclusions. **Materials:** Instructor Manual, Verbal Reasoning by R.S.Aggarwal		
Unit – 3	Quantitative Aptitude – Part – 5	6
Geometry – Straight Line – Triangles – Quadrilaterals – Circles – Co-ordinate Geometry – Cube – Cone – Sphere. **Materials:** Instructor Manual, Aptitude book		
Unit – 4	Data Interpretation and Analysis	6
Data Interpretation based on Text – Data Interpretation based on Graphs and Tables. Graphs can be ColumnGraphs, Bar Graphs, Line Charts, Pie Chart, Graphs representing Area, Venn Diagram & Flow Charts. **Materials:** Instructor Manual, Aptitude Book		
Unit – 5	Technical & Programming Skills – Part 2	6
Core Subject – 4, 5, 6 **Practices:** Questions from Gate Material. **Materials:** Text Book, Gate Material		
	Total	30

Evaluation Criteria			
S.No.	Particular	Test Portion	Marks

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1	Evaluation 1 Written Test	15 Questions each from Unit 1, 2, 3, 4 & 5 (External Evaluation)	50
2	Evaluation 2 – Oral Communication	GD and HR Interview (External Evaluation by English, MBA Dept.)	30
3	Evaluation 3 – TechnicalInterview	Internal Evaluation by the Dept. – 3 Core Subjects	20
		Total	100

Reference Books

1. Aggarwal, R.S. “A Modern Approach to Verbal and Non-verbal Reasoning”, Revised Edition 2008, Reprint 2009,S.Chand & Co Ltd., New Delhi.
2. Abhijit Guha, “Quantitative Aptitude”, TMH, 3rd edition
3. Objective Instant Arithmetic by M.B. Lal & GoswamiUpkar Publications.
4. Word Power Made Easy by Norman Lewis W.R. GOYAL Publications

Note:

- Instructor can cover the syllabus by Class room activities and Assignments (5 Assignments/week)
- Instructor Manual has Class work questions, Assignment questions and Rough Work pages
- Each Assignment has 20 questions from Unit 1,2,3,4,5 and 5 questions from Unit 1(OralCommunication) & Unit 5(Programs)
- Evaluation has to be conducted as like Lab Examination.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	1	1	2	1	1	2	3	2	3	1	1
CO2	2	1	2	2	1	2	1	1	2	3	3	3	2	2
CO3	2	1	2	2	1	1	1	1	2	3	2	3	2	2
CO4	2	2	2	2	2	1	1	1	2	3	3	3	3	3
CO5	2	2	2	2	2	2	2	2	2	3	2	3	3	3

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50 HS 001 – Engineering Economics and Financial Accounting								
B.E. Civil Engineering								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	50	50	100

Objective(s)	1. To make the Engineering student to know about the basics of economics. 2. To gain knowledge on, how to organize a business with financial aspects related to business. 3. To study about different methods of appraisal of projects and pricing techniques. 4. To study about budgeting techniques. 5. To know about applications of Break Even Analysis in Civil Engineering Projects.
Course Outcomes	**At the end of this course the students will be able to** 1. Apply suitable demand forecasting techniques. 2. Describe forms of business in an organization and various kinds of banking. 3. Study about cash flow statements and budgeting process. 4. Differentiate between fixed cost and variable cost and cost analysis techniques. 5. Apply break even analysis in engineering projects.

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

Basic Economics **[9]**

Definition of economics – nature and scope of economics – basic concepts of economics – factors of production – demand analysis – definition of demand – Law of demand – Exception to law of demand – Factors affecting demand – elasticity of demand – demand forecasting – definition of supply – factors affecting supply – elasticity of supply – market structure – perfect competition – imperfect competition - monopoly – duopoly – oligopoly and bilateral monopoly .

Organization and Business Financing **[9]**

Forms of business – proprietorship – partnership - joint stock company - cooperative organization – state Enterprise - mixed economy - Money and banking – kinds of banking - commercial banks - central banking functions - control of credit - monetary policy - credit instrument – Types of financing - Short term borrowing - Long term borrowing - Internal generation of funds - External commercial borrowings - Assistance from government budgeting support and international finance corporations.

Financial Accounting and Capital Budgeting **[9]**

The balance Sheet and related concepts – The profit and loss statement and related concepts – Financial ratio analysis – Cash flow analysis – fund flow analysis – Capital budgeting– Average rate of return – Payback period – Net present value and internal rate of return.

Cost Analysis **[9]**

Types of costing – traditional costing approach - activity based costing - Fixed Cost – variable cost – marginal cost – cost output relationship in the short run and in long run – pricing practice – full cost pricing – marginal cost pricing – going rate pricing – bid pricing – pricing for a rate of return – appraising project profitability - cost benefit analysis – feasibility reports – appraisal process – technical feasibility - economic feasibility – financial feasibility.

Break Even Analysis **[9]**

Basic assumptions –break even chart – managerial uses of break-even analysis - applications of break-even analysis in engineering projects

Total Hours:45 hours

Text book(s):

1	Khan MY and Jain PK., “Financial Management” McGraw - Hill Publishing Co., Ltd., New York, 2000.
2	Varshney RL and Maheshwary KL. “Managerial Economics” S Chand and Co., New Delhi, 2001.

Reference(s):

1	Barthwal R.R., “Industrial Economics - An Introductory”, New Age Publications, New Delhi, 2001.
2	Samuelson P.A., “Economics - An Introductory Analysis”, McGraw - Hill & Co., New York, 2000.
3	V.L.Mote, Samuel and G.S.Gupta, “Managerial Economics – Concepts and Cases”, Tata Mcgraw Hill Publishing Company Ltd., New Delhi.
4	B.Senthil Arasu and J.Praveen Paul., “Engineering Economics and Financial Accounting”, SCITECH Publications (INDIA) Pvt. Ltd., Chennai, 2017.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	1	2	3	2	3	1	2	1	3	3
CO2	3	2	3	1	1	2	1	1	3	2	3	2	2	2
CO3	2	1	2	1	2	3	3	1	1	3	2	1	2	3
CO4	3	2	3	3	2	2	1	2	2	1	3	2	3	2
CO5	2	1	3	1	1	3	2	1	2	2	3	1	2	2

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K.S.Rangasamy College of Technology – Autonomous								R2018
50 CE 701 - Prestressed Concrete								
B.E. - Civil Engineering								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VII	3	1	0	60	4	50	50	100

Objective(s)	• To gain knowledge on types and methods of prestressing, advantages of prestressing concrete • To know the design concepts for prestressed concrete elements using IS: 1343 Codal provisions • To gain knowledge on design of continuous member and other special structural elements like prestressed sleepers, prestressed concrete pipes, prestressed poles
Course Outcomes	CO1: Evaluate the internal forces and deflection in prestressed concrete. CO2: Design the pre-stressing layout and understand the behavior of pre-stressed concrete elements under practical loading conditions CO3: Practice the Analysis and design of continuous beams and extend the knowledge on concept of linear transformation. CO4: Outline the design of tension and compression members in prestressing. CO5: Illustrates the design of composite members and partial prestressing.

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

PRINCIPLES OF PRESTRESSING **[9]**

Introduction-Materials for prestressed concrete- Systems and methods of prestressing – Analysis of sections – Stress concept – Strength concept – Load balancing concept – Effect of loading on the tensile stresses in tendons- Introduction on Composite Prestressed member.

LOSSES AND DEFLECTION OF PRESTRESSED CONCRETE MEMBERS **[9]**

Analysis method losses- Elastic shortening – Friction – Anchorage slip – Force variation Diagram – creep of concrete – Shrinkage of concrete – Relaxation of steel. Effect of tendon profile on deflections – Factors influencing deflections – short term deflection uncracked members – predictions of long-term deflections.

DESIGN OF FLEXURAL MEMBERS **[9]**

Behaviour of flexural members, determination of ultimate flexural strength – Codal provisions -Design of flexural members. Design for shear based on IS 1343 code - Determination of anchorage zone stresses in post-tensioned beams by Magnel's method and IS 1343 code method-Design of anchorage zone reinforcement.

DESIGN OF CONTINUOUS BEAMS **[9]**

Analysis and design of continuous beams - Methods of achieving continuity – concept of linear transformations, concordant cable profile and cap cables.

DESIGN OF SPECIAL ELEMENTS **[9]**

Circular Prestressing- Design of prestressed concrete tanks - Types and design of prestressed concrete pipes, Poles and sleepers.

Total Hours: 45 + 15(Tutorial) = 60 hours

Text book(s):

1	Krishna Raju.N, "Prestressed Concrete", Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2018.
2	Lin, T.Y & Burns, "Design of Prestressed Concrete Structures" John Wiley & Sons, 2010.

Reference(s):

1	Devadas Menon & A.K Sengupta, "Prestressed Concrete Structure (Web Course)", NPTEL Course Notes, 2008.
2	Krishna Raju.N, "Problems & Solutions – Prestressed Concrete", CBS Publishers & Distributors., New Delhi, 2015.
3	Rajagopalan.N "Prestressed Concrete", Narosa Publishing House, 2005.
4	IS1343:2012, Code of Practice for Prestressed Concrete, Bureau of Indian Standards, New Delhi, 2012.

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CO1	2	3	1					1	1	2		2	3	3
CO2	2	3	3	2	2			2	1	2		2	2	2
CO3	2	3	3	2	2			2	1	2		2	2	3
CO4	2	3	3	2				1	1	2		2	3	2
CO5	2	3	3	1	2			1	1	2		2	2	2

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K.S.Rangasamy College of Technology – Autonomous								R2018
51 CE 702 - Construction Management								
B.E. - Civil Engineering								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	50	50	100

Objective(s)	• To gain knowledge about tendering documents. • To assess how to plan construction project schedules and create activity network diagrams. • To gain knowledge on scheduling techniques and determine the cost of the project and control the cost of the project. • To study the applications of HRM in construction industry, quality control in construction and industrial management. • To assess the rules and regulations of work environment.
Course Outcomes	**At the end of this course the students will be able to** CO1: Gain knowledge about various types of tender and contracts and methods of construction planning. CO2: Sketch the activity network diagrams by using and CPM/PERT techniques. CO3: Compute the applications of Human Resources Management on construction industry. CO4: Maintain the quality at construction site. CO5: Improve the relationship between management and labour by adopting various techniques.

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

Construction Practices and Planning **[09]**

Contract: Types of Contracts - Contracts documents - Contractual obligation – Specifications. Tender: Tender Notice – Tender documents - Types. Basic concepts in the development of construction plan – Choice of technology and construction method – Defining works tasks – Definition precedence relationships among activities – Estimating activity duration – Estimating resource requirements for work activities.

Scheduling Procedures and Techniques **[09]**

Introduction – Preparation of network – Advantages of Network analysis – Activity and Event oriented network – Planning by CPM & PERT – Comparison between CPM & PERT – CPM: Calculation of critical path – Critical activity – Project Completion Time – Determination of activity floats (or) slag. PERT: Determination of Expected time, Standard deviation and Variance – Uses of advanced scheduling techniques – Crashing and time cost trade off – Introduction to application of software in project management.

Cost Control **[09]**

Preliminary cost estimate for BOQ- Month wise expenditure - Cash flow statement - Job cost ledger- Monthly stock statement- Inventories- Material receipt- Overhead cost- Invoicing- Reconciliation of materials- JCR Financial Profit projections.

Quality Control and Safety During Construction **[09]**

Quality and safety concern in India – Importance of quality and safety – Organizing for quality and safety – Elements of safety – Quality assurance techniques – Safety measures – Prevention of fire at construction site.

Industrial Management **[09]**

Rights and responsibilities of owners – Relationship between management and labor – Industrial psychology – Motivation – Merit rating – Incentive plans – Leadership: Leadership quality – Importance – styles – Communication: Types – Methods – Process – Importance - Methods of the Project Management.

Total Hours: 45 Hours

Text book(s):

1	Seetharaman.S, “Construction engineering and management”, Dhanpat Rai Publications, Pune 2010.
2	Chitkara.K.K, “Construction project management – Planning, Scheduling and control”, Tata Mc. Hill Pub. Co.,ND, 2012.

Reference(s):

1	Meyyappan.P.L. “Construction Management” Pradeepa Publications, Coimbatore, 2010.
2	Prasanna Chandra, “Project Management”, Tata McGraw Hill, New Delhi, 2007.
3	Sharma J. C., “Construction Management and Accounts”, Sathyaprakasam, NewDelhi, 2006.
4	S. Keoki Sears, Glenn A. Sears and Richard H. Clough, “Construction Project Management: A Practical Guide to Field Construction Management”, John Wiley & Sons, 2015.

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CO1		1	3		3		1	3		1		1		2
CO2	3		1		1	2	2	1	2	2	3	2	2	
CO3		2	2	2	1	1	2	2					3	
CO4	3		2		2	2	3	1	2	3		2		2
CO5	1	3		1	1	2	2	2	1	2	1	2	3	

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K.S.Rangasamy College of Technology – Autonomous R2018								
50 AC 001 – Research Skill Development I								
Semester	Hours / Week			Total Hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VII	1	0	0	10	0	100	0	100

Objective(s)	• To learn about the effective usage of power point presentation • To prepare presentation with various effects • To visualize the data in the presentation • To acquire knowledge about data sources • To investigate the research articles based on various applications
Course Outcomes	**At the end of the course, the students will be able to** CO1: Develop presentation with visual effects CO2: Prepare a presentation with supporting data CO3: Attain the importance of research and data collection CO4: Analyze the various sources of research articles CO5: Interpret the tools and methods in preparing manuscript

Note: Hours notified against each unit in the syllabus are only indicative but are not decisive. Faculty may decide the number of hours for each unit depending upon the concepts and depth. Questions need not be asked based on the number of hours notified against each unit in the syllabus**.**

Preparing a Presentation **(3)**

Presenting data using Power Point- Power Point preparation and presentation, Design principles for creating effective Power Point slides with visuals displaying data. - Profile, - Problem, and a set of basic Excel charts, use to create a presentation.

Creating effective slides using PowerPoint **(2)**

Create effective slides using PowerPoint. Tools within Power Point, structure story line, create story boards, identify primary elements of slide design, display data and finalize slide presentation.

Research Designs and Data Sources **(3)**

Overview of the topics: process of data collection and analysis. Starting with a research question - Review of existing data sources- Survey data collection techniques- Importance of data collection- Basic features affect data analysis when dealing with sample data. Issues of data access and resources for access.

Measurements and Analysis Plan **(2)**

Importance of well-specified research question and analysis plan: various data collection strategies - Variety of available modes for data collection – review of literature - Tools at hand for simple analysis and interpretation.

Total Hours: 10

Text Book(s):

1.	Judy Jones Tisdale. Effective Business Presentations. Gulf Coast Books LLC. ISBN-13: 978-0130977359, 2004.
2.	Frauke Kreuter. Framework for Data Collection and Analysis,2018. https://www.coursera.org/learn/data-collection-framework

Reference(s)

1.	Kothari, C.R. andGaurav Garg, “Research Methodology: Methods and Techniques”, New Age International Publishers, 2013
2.	Srivastava, T.N. and Rego, S., "Business Research Methodology", Tata McGrawHill Education Pvt. Ltd., Delhi, 2019.

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CO1	3	3		3	2				2	3	3			3
CO2	3	3	1	2	2		2		2	3	2	1		3
CO3	3	3	2	2			2		1	3		1	3	3
CO4	3	3	3	2		2	1	2		3	2	2	3	2
CO5	3	3	2	2		2	1		2	3	2	2	3	2

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K.S.Rangasamy College of Technology – Autonomous								R2018
51 CE7P1 Estimation and Quantity Surveying Laboratory								
B.E.Civil Engineering								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VII	1	0	2	45	2	50	50	100

Objective(s)	1. Classify Basic concepts, techniques and applications of Estimation and costing. 2. Understand how to prepare a detailed estimate for a residential building and calculate the quantities for various items of works involved in buildings, water supply and sanitary works. 3. Analyze the rates for various items of work and to prepare a abstract estimate 4. Designing the preparation of bar bending schedule for reinforcement works 5. At the end of this course the student shall be able to estimate the various material quantities for different types of work as per specifications by manual and also software approaches
Course Outcomes	**At the end of this course the students will be able to** CO1: Assess building elements by length, area and volume in accordance with the principles of quantity surveying CO2: Select the appropriate method of building estimate. CO3: Demonstrate the different types of specifications and illustrate the detailed specification which specifies description and requirements. CO4: Categories the schedule of rates for different works and detailed estimate which consists of accurate working out of quantities and cost. CO5: Prepare a technical report in such a manner that the report gives an idea, about the entire work and the results arrived from software and manual calculation

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

INTRODUCTION AND METHODS OF BUILDING ESTIMATE

General–units of measurements–requirement of estimation–types of estimate–simple problems on building, steps and boundary walls using long wall, short wall and centre line methods–lump sum items **[09]**

SPECIFICATIONS

General specification–detailed specifications for various items of works: Earth work excavation–cement concrete–damp proof course–formwork–brick masonry–flooring–false ceiling–plastering–painting and wood work–sanitary and water supply, interior, electrical item **[09]**

RATE ANALYSIS

Purpose, requirement–schedule of rates and data book–procedure of rate analysis–requirement of labour and materials for different works–obtaining rates for various items of work namely, cement mortar–cement concrete–plastering–flooring–weathering course–pointing–painting. **[09]**

DETAILED ESTIMATION. **[09]**

Earth work, plain cement concrete, masonry–random rubble brickwork, reinforced cement concrete works, bar bending, scaffolding, centering, concreting, stair case, plastering–wall, ceiling, flooring, woodwork, wall protective works–white /colour washing, paints, electrification–water supply and sanitary works–principles of report preparation.

SOFTWARE APPLICATION

Introduction to software application in different type of estimates–excel spread sheet– calculation of different quantities by estimation software – Application of Estimator Software. **[09]**

Total Hours: 45 hours

Text book(s):

1	Birdie. G. S., "Estimating and Costing", Dhanpat Rai Books Publisher & 6th Edition, 2014.
2	Dutta, B.N., "Estimating and Costing in Civil Engineering", UBS Publishers & Distributors Pvt.Ltd. ND, 2010.

Reference(s):

1	Kohli.D.D and Kohli. R.C., "A Text Book of Estimating and Costing (Civil)", S.Chand & Company Ltd.,2004.
2	Rangwala S.C., "Estimating and Costing", Charotar Publishers & Co., New Delhi, 2000.
3	M. Chakraborthi "Estimation, costing and specifications", laxmi publications.
4	Standard schedule of rates and standard data book by public works department.

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CO1	3	3	1	1	2	1		1	1	1	1	1	3	2
CO2	3	3	2	2	2	1		1	1	1	1	1	3	2
CO3	3	3	1	1	2	1		1	1	1	1	1	3	2
CO4	3	3	2	3	2	2	1	1	2	2	2	2	3	3
CO5	3	3	3	3	3	3	2	2	2	2	3	1	3	2

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K.S.Rangasamy College of Technology – Autonomous								R2018
50 CE 7P2 - Design Project								
B.E.Civil Engineering								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VII	0	0	2	45	2	100	-	100

Objective(s)	• To identify the thrust areas any one of the disciplines of Civil Engineering; e.g., Design of an RC structure, Design of a waste water treatment plant, Design of a foundation system, Design of traffic intersection etc. • To impart and improve the design capability of the student. • To use the knowledge acquired in Civil Engineering to do a project, which allows the students to come up with design, expressing their ideas in a novel way. • To submit a complete report on the design consisting of the data given, the design calculations, specifications if any with complete set of drawings. • To train the students in preparing project reports and to face reviews and viva voce examination.
Course Outcomes	**At the end of this course the students will be able to** CO1 Select the broader area of research work in the field of Civil Engineering. CO2 Outline the aim and objective on the proposed area of research. CO3 Review the appropriate literature related to the chosen topic of research. CO4 Generate the suitable methodology which is suitable for new ideas to work on a specific topic CO5 Summarize the results of the works carried out and prepare the entire document to produce the detailed information of the project.

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

EVALUATION PROCEDURE

The method of evaluation will be as follows:

1. Internal Marks : 40 marks

(Decided by conducting 3 reviews by the Project Coordinator appointed by the HOD)

2. Evaluation of Project Report : 60 marks

(Evaluated by the examiner appointed by the HOD with the approval of HOI)

Total : 100 marks

Total Hours: 45 hours

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		1	1	3	2	2	1		3				2	2
CO2	1	1	2	3	2	1			3		1	1	2	2
CO3	2		1	3	2			1	2		1	2		3
CO4	1	1		1	1	3	1	2	2				1	1
CO5	2			2	2				1		2	1	1	1

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K.S.Rangasamy College of Technology – Autonomous								R2018
50 CE7P3 INPLANT TRAINING/ INDUSTRIAL INTERNSHIP								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VII	0	0	0	45	1	100	-	100

Objective(s)	1. An In plant training is a learning opportunity for students. 2. Students should therefore receive feedback on their performance so that they can grow professionally. 3. Overall professional development of Civil Engineers is the need of the day for enabling them to sustain in competitive global environment. 4. At the end of this course the students will be able to gain practical knowledge by undergoing training in the construction field. 5. Enhancing the employability skills and start-up skills to increase his ability to engage in, life-long learning.
Course Outcomes	At the end of this course the students will be able to 1. To provide practical exposure in Civil Engineering related organizations. 2. Exposure to the industrial environment and Recognize the requirement of the industry and cope up with the industrial scenario. 3. Identify career paths taking into account their individual strengths and aptitude and Prepare a report about the work experience in industry. 4. Communicate effectively through technical presentation. 5. Develop individual confidence to handle various engineering assignments and expose themselves to acquire life skills to meet societal challenges.

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

- Students undergo in - plant training during sixth semester summer vacation (minimum of six weeks).
- Reports containing the observation of the students after the training with their personal comments / suggestions are to be prepared and submitted in the beginning of seventh semester.
- A technical presentation to be done by the students immediately after submission of the report at the beginning of seventh semester.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3			3	1	3	1	2	2	3	3	3	2	2
CO2	3	1	1	3	1	3			2	2	3	3	2	2
CO3	2		1	2		2	1		2	2	3	3		3
CO4	3	2	2	3	2	2		2	2	2	3	3	1	2
CO5	3	2		2	2	1	1	2	2	2	3	3	1	2

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K.S.Rangasamy College of Technology - Autonomous Regulation								R 2018
Semester VII								
Course Code	**Course Name**	**Hours/Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CA**	**ES**	**Total**
50 TP 0P5	**CAREER COMPETENCY DEVELOPMENT V**	**0**	**0**	**2**	**0**	**100**	**00**	**100**

Course Objectives	• To help the learners to practice the written and oral communication skills in the academic and professional contexts • To help the learners to practice the verbal and logical reasoning ability to meet out the requirements of both competitive exams and companies • To help the learners to practice effectively the aptitude modules for company based recruitments and competitive exams • To help the learners to practice effectively the data interpretation and analysis modules for company based recruitments and competitive exams • To help the learners to hone the technical and programming skills for better employability
Course Outcomes	**At the end of the course, the student will be able to** 1. Reinforce the written and oral communication skills in the academic and professional contexts 2. Discriminate and assess the verbal and logical reasoning ability to meet out the employability requirements of the companies 3. Relate the aptitude modules for company based recruitments and competitive exams effectively 4. Compare and illustrate the data interpretation and analysis modules effectively for company based recruitments and competitive exams 5. Formulate and integrate the technical and programming skills to be focused on better employability and code contests.

Unit – 1	**Written and Oral Communication**	Hrs
Self-Introduction – GD – HR Interview Skills – Corporate Profile Review - Practices on CompanyBased Questions and Competitive Exams **Materials:** Instructor Manual		6
Unit – 2	**Verbal & Logical Reasoning**	6
Practices on Company Based Questions and Competitive Exams **Materials:** Instructor Manual		
Unit – 3	**Quantitative Aptitude**	6
Practices on Company Based Questions and Competitive Exams **Materials:** Instructor Manual		
Unit – 4	**Data Interpretation and Analysis**	6
Practices on Company Based Questions and Competitive Exams **Materials:** Instructor Manual		
Unit – 5	**Programming & Technical Skills – Part 3**	6
Data Structure - Arrays – Linked List – Stack – Queues – Tree – Graph. Practices on Algorithms andObjective Type Questions. **Materials:** Instructor Manual		
	Total	30

Evaluation Criteria

S.No.	Particular	Test Portion	Marks
1	Evaluation 1 - Written Test	15 Questions each from Unit 1, 2,3, 4 & 5 (External Evaluation)	50
2	Evaluation 2 - Oral Communication	GD and HR Interview (External Evaluation by English, MBA Dept.)	30
3	Evaluation 3 – Technical Interview	Internal Evaluation by the Dept. – 3 Core Subjects	20
		Total	**100**

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Reference Books

1. Aggarwal, R.S. “A Modern Approach to Verbal and Non-verbal Reasoning”, Revised Edition 2008,Reprint 2009, S.Chand & Co Ltd., New Delhi.
2. Abhijit Guha, “Quantitative Aptitude”, TMH, 3rd edition
3. Objective Instant Arithmetic by M.B. Lal & GoswamiUpkar Publications.
4. Word Power Made Easy by Norman Lewis W.R. GOYAL PUBlications

Note:

- Instructor can cover the syllabus by Class room activities and Assignments(5 Assignments/week)
- Instructor Manual has Class work questions, Assignment questions and Rough work pages
- Each Assignment has 20 questions for Unit 1,2,3,4 & 5 and Unit 5 and 5 questions from Unit 5(Algorithms) &Unit 1(Oral Communication)
- Evaluation has to be conducted as like Lab Examination.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	1	1	2	1	1	2	3	2	3	1	1
CO2	2	1	2	2	1	2	1	1	2	3	3	3	2	2
CO3	2	1	2	2	1	1	1	1	2	3	2	3	2	2
CO4	2	2	2	2	2	1	1	1	2	3	3	3	3	3
CO5	2	2	2	2	2	2	2	2	2	3	2	3	3	3

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K.S.Rangasamy College of Technology – Autonomous R2018								
50 AC 002 – Research Skill Development II								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VIII	1	0	0	15	0	100	0	100

Objective(s)	• To identify the ethics in preparing research paper • To organize manuscript for submission • To attain knowledge for filing Patent • To apply for copy right • To develop and deploy Mobile App. in play store
Course Outcomes	**At the end of the course, the students will be able to** CO1: Prepare a manuscript for journal publication. CO2: Apply the manuscript for publication CO3: Interpret the process of obtaining copyright and patent CO4:Analyze the various provisions to share the application CO5:Create and publish the mobile application in the digital store

Note: Hours notified against each unit in the syllabus are only indicative but are not decisive. Faculty may decide the number of hours for each unit depending upon the concepts and depth. Questions need not be asked based on the number of hours notified against each unit in the syllabus**.**

Preparation of Manuscript **(3)**

Data necessary before writing a paper: the context in which the scientist is publishing. Learning and identification of research community - advantages of scientific journal publication and manuscript preparation - ethical values in publishing.

Writing the paper **(2)**

Writing research paper - structure of the paper - usage of bibliographical tools - abstract preparation and to do a peer review for the abstract of the others, as in real academic life. Plagiarism of the prepared manuscript.

Copyright **(2)**

Copyright law in India-Meaning of copyright-Classes of works for copyright protection -Ownership of Copyright-Assignment of copyright-Intellectual Property Rights (IPR) of Computer Software-Copyright Infringements-Procedure for registration.

Patents **(3)**

Patent System In India -Types of Patent Applications-patentable invention - Not patentable-Appropriate office for filing -Documents required Publication and Examination of Patent Applications -Grant of Patent-Infringement of Patents -E-filing of Patent applications

Deploying Mobile App. in play store **(5)**

Introduction to Application Stores – Play Store, App Store, Microsoft Store, Creating App – Android, iOS, UWP, Defining Manifest, Certifying App, Create Store Listing, Sharing Screenshots, Sharing App Credentials for

Total Hours: 15

Text Book(s):

1.	Mathis Plapp. How to Write and Publish a Scientific Paper (Project-Centered Course). https://www.coursera.org /learn/how-to-write-a-scientific-paper#instructors
2.	Rajkumar S. Adukia ,Handbook On Intellectual Property Rights In India,2007
3	Dr. M. Kantha Babu ,"Text book on Intellectual Property Rights",2019.

Reference(s)

1.	Kothari, C.R. andGaurav Garg, "Research Methodology: Methods and Techniques", New Age International Publishers, 2013
2.	Srivastava, T.N. and Rego, S., "Business Research Methodology", Tata McGrawHill Education Pvt. Ltd., Delhi, 2019.
3.	https://support.google.com/googleplay/android-developer/answer/9859152
4.	https://developer.apple.com/ios/submit/
5.	https://docs.microsoft.com/en-us/windows/uwp/publish/app-submissions

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3				3		2	3	1		3
CO2	3	3	3	3			1	2	2	2	2	1		3
CO3	3	3	2	2	2		2	2	1	2	1	1	3	3
CO4	3	3	3		3	2	2		2		2	2	3	2
CO5	3	3	3		3	2	2		2		2	2	3	2

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K.S.Rangasamy College of Technology – Autonomous								R2018
50 CE 8P1 - Project Work								
B.E. Civil Engineering								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VIII	0	0	16	45	8	50	50	100

Objective(s)	• To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same. • To develop the management skills to achieve the project goal by working as a team. • To learn the design methodologies for different structural members • To communicate and collaboratively work in peer groups to develop optimized solutions for problems in Civil Engineering Field • To demonstrate the technical skills acquired to provide feasible solutions for real life problems.
Course Outcomes	**At the end of this course the students will be able to** CO1 Apply design techniques in the project and experience their outcome in their own project scenario. CO2 Review and evaluate the available literature on the chosen problem CO3 Formulate the methodology to solve the identified problem CO4 Apply the principles, tools and techniques to solve the problem CO5 Prepare and present project report

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

EVALUATION PROCEDURE

The method of evaluation will be as follows:

1. Internal Marks : 50 marks

(Decided by conducting 3 reviews)

2. Evaluation of Project Report : 20 marks

Evaluated by the examiner appointed by the COE (Autonomous).

Every student belonging to the same group gets the same mark.

3. Viva Voce examination : 30 marks

Evaluated by the examiner appointed by the HOD with the approval of HOI,

external examiner appointed by the COE (Autonomous)

Total : 100 marks

Total Hours: 45 hours

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		1	2	3	2	1	2		3				2	3
CO2	1	2	3	2	3	2	3		3		2	1	2	3
CO3	2		1	2	2			2	2		2	2		3
CO4	2	1		2	1	2	1	2	2				2	2
CO5	1			3	3				1		2	1	2	2

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K.S.Rangasamy College of Technology – Autonomous R2018

50 CE E11 - Remote Sensing and GIS

B.E. Civil Engineering

Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
V	3	0	0	45	3	50	50	100

Objective(s)

- To make them aware of Remote Sensing & GIS Techniques and its components.
- Learner has to familiar about various aerial and satellite platforms.
- To make them to aware of Remote sensing data collection process with help of modern sensors.
- To apply the concept spatial data Image interpretation and various map projection.
- To provide the platform about learning the fundamental concepts of Geographical Information system (GIS) as an analyzing tool.

Course Outcomes

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

1. Describe the components of EMR spectrum and Energy interaction with atmosphere and different earth surface objects.
2. Identify the different types of plat forms and sensors its various data capturing products and its interpretation.
3. Make them familiar to GIS and its components, various data types in GIS and standard software's.
4. Analyze data conversion methods like scanning and digitization.
5. Recognize GIS in both spatial and aspatial data.

Remote Sensing

Basic concept of Remote Sensing, Remote Sensing data collection. Limitation and advantages of Remote sensing, Remote Sensing Process. Electromagnetic spectrum, Energy interaction with atmosphere and earth surface features Soil, Water and Vegetation. Image registration and image and false colour composite, elements of visual image interpretation techniques **[09]**

Remote Sensing platforms and sensors

Indian satellites and Sensors characteristics, Remote Sensing platforms, Sensors and properties of digital data. Data formats: Introduction. Platforms-IRS, Landsat, SPOT, Cartosat, Ikonos and Envisat etc. Resolution and types. Basics of digital image processing- Introduction to digital data – Systematic errors and Non systematic errors. Image enhancement and image filtering. **[09]**

Geographic Information System

Introduction to GIS: Components of GIS : Geographically referenced data, Spatial data-Attribute data.GIS operations: Spatial data input-Attribute data management. Geographic co-ordinate system, Datum: Map projections- type. Projected coordinate systems-UTM zones. **[09]**

Data models

Vector data model :Representation of simple features-Topology and its importance: Coverage and its data structure, Shape file:Relational data base. Raster data model: Elements of raster data model. Types of Raster data, Raster data structure, Data conversion. **[09]**

Integrated Applications of Remote Sensing and GIS

Applications in land use land cover analysis .change detection, water resources, urban planning and environmental planning. Natural resource management and traffic management-Location based Services and its applications. **[09]**

Total Hours: 45

Text book (s) :

1	Basudeb Bhatta, "Remote Sensing and GIS", Oxford University Press, New Delhi, Second Edition, 2014.
2	Thomas Lillesand, W Ralph, Kiefer, Jonathan Chipman, " Remote Sensing and Image Interpretation", 7th Edition, Wiley,2015

Reference (s) :

1	M D Steven and J A Cllark, "Application of Remote sensing in Agriculture", Butterworths, London,1990.
2	Space Applications Centre. Manual for Forest mapping and Damage detection using satellite data, Report No. IRS-UP/SAC/FMDD/TN/16/90, pp-253, 1990.
3	Peter A.Burrough, A Rachael and McDonnell, "Principles of GIS", Oxford University Press,2000.
4	R Michael Hord, "Remote Sensing methods and application", John Wiley and Sons, New York, 1986.

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CO1	1	2		2			3		2	2		2	1	2
CO2			2	3	2		2		2				1	2
CO3			1		3	2				2	2		2	2
CO4			2		2						1		2	2
CO5	1	2			1				2				2	2

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K.S.Rangasamy College of Technology – Autonomous								R2018
50 CE E12 - RENEWABLE ENERGY RESOURCES								
B.E. CIVIL ENGINEERING								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
V	3	0	0	45	3	50	50	100

Objective(s)	• To apply the energy conservation technique in various applications. • To Gain knowledge in the working of solar photovoltaic system. • To understand the need of wind energy conversion techniques. • To analyze the performance of Bio-mass and Bio-gas plants. • To describe the working of fuel cells and Hydrogen energy.
Course Outcomes	**At the end of this course the students will be able to** CO1: Gain knowledge on the challenges and problems associated with the use of various energy sources and energy conservation techniques. CO2: Analyse the performance of various solar collectors and working of solar photovoltaic system. CO3: Classify the performance of wind energy systems and performance of Bio-mass and Bio-gas plants. CO4: Recognize the functioning of Geo thermal, ocean and small hydro plants CO5: Determine the System sizing and battery charging Techniques and working of fuel cells.

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

Statistics on Energy Sources **[09]**

Role and potential of non-renewable and renewable source-Importance of renewable energy sources-advantages and disadvantages of non-conventional energy sources-Salient features of non-conventional energy sources. Availability of resources and future trends-Energy scenario in India–Growth of energy sector and its planning in India .Global environmental crisis-Impact of renewable energy generation on environment, Kyoto protocol, Carbon Credit, CDM

Solar Energy **[09]**

Introduction-Solar radiation at the earth's surface-Solar Radiation measurements-Estimation of average solar Radiation. Solar energy collectors – Classifications – Flat plate collectors - Concentrating collectors - Comparison. Solar greenhouse - Solar thermal Electric power plant. Principles of photovoltaic conversion–PV system components–types of solar cells–PV cell–module and array–array design-equivalent circuit–V and P-V characteristics. Solar Photo Voltaic applications- Solar energy policies and regulations of India.

Wind Energy **[09]**

Introduction - Basic principles of wind energy conversion: Nature of the wind, power in the wind, forces on the blades – wind data and energy estimation - site selection - classification of wind energy conversion systems - Advantages and Disadvantages -Types of wind machines - Horizontal axis machine - Vertical axis machine - Generating system - Energy Storage – Application of wind energy - Safety and environmental aspects.

Other Renewable Energy Sources **[09]**

Bio energy - Introduction Biomass conversion technologies – types of bio gas plants – applications – Biomass energy programme in India. Tidal energy – Basic principle of tidal power – components and operations of tidal power plant - Geothermal energy-Geothermal Sources–Prospects of geothermal energy in India-Ocean energy resources– principles of ocean thermal energy conversion (OTEC)–Methods of Ocean thermal electric power generation.

Waste to Energy and Grid Connected Systems **[09]**

Energy produced from sewage, Industrial effluents, Municipal Solid Waste, Industrial sludge. Case studies. Basics of stand-alone and grid-connected systems–hybrid systems–synchronization with grid– Battery–types-Battery charging and charge regulator - Fuel cells-Hydrogen energy-Small hydro resources-basic operation and schematic only.

Total Hours: 45

Text book(s):

1. Rai G.D., “Non-Conventional Energy Sources”, Khanna Publishers, 2011.
2. Twidell and Wier, “Renewable Energy Resources”, CRC Press (Taylor and Francis), 2011.

Reference(s):

1. Tiwari and Ghosal, “Renewable energy resources”, Narosa Publishing House, 2007.
2. Ramesh R and Kumar K.U, “Renewable Energy Technologies “, Narosa Publishing House, 2004.
3. Kothari D.P, Singhal ., K.C., “Renewable energy sources and emerging technologies”, P.H.I, New Delhi, 2010.
4. Mittal K M ,“Non-Conventional Energy Systems”, Wheeler Publishing Co. Ltd, New Delhi, 2003.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		1	3	1	3	3	1	3		1		1		2
CO2	3					2	2	2	2	2	3	2	2	1
CO3		2		2		3	1	2		2		3	3	
CO4	3		3	1	2	2	3	3	2	3		2		2
CO5	1	3		1		3	2	2	1	2	1	2	3	1

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K.S.Rangasamy College of Technology – Autonomous								R2018
50 CE E13 - Traffic Engineering and Management								
B.E. Civil Engineering								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
V	3	0	0	45	3	50	50	100

Objective(s)	• To know an overview of Road user characteristics and vehicle performance. • To gain knowledge in traffic regulation, management and traffic safety with integrated approach in traffic planning as well. • To get knowledge and understanding of various aspects of highway geometrics, different road materials. • To study about road safety measures environmental hazards. • To study about the traffic characteristics, traffic safety, causes of road accidents, traffic problem, IRC standards in traffic management.
Course Outcomes	**At the end of this course the students will be able to** CO1: Study about the vehicle characteristics, traffic planning and various traffic regulations. CO2: Gain knowledge about various traffic surveys and its applications. CO3: Study on design of traffic signals, road markings and visual aids and its importance. CO4: Identify the importance of traffic safety and various causes of road accidents. CO5: Describe the requirements of traffic management and IRC Standards.

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

Traffic Planning and Characteristics **[09]**

Road Characteristics – Road user characteristics – PIEV theory – Vehicle – Performance characteristics – Fundamentals of Traffic Flow – Urban Traffic problems in India – Integrated planning of town ,country ,regional and all urban infrastructure – Towards Sustainable approach. – land use & transport and modal integration.

Traffic Surveys **[09]**

Traffic Surveys – Speed, journey time and delay surveys – Vehicles Volume Survey including non-motorized transports – Methods and interpretation – Origin Destination Survey – Methods and presentation – Parking Survey – Accident analyses -Methods, interpretation and presentation – Statistical applications in traffic studies and traffic forecasting – Level of service – Concept, applications and significance- Intelligent Transport System - BRTS, Metro and Mono Traffic Systems.

Traffic Design and Visual Aids **[09]**

Intersection Design - channelization, Rotary intersection design – Signal design – Coordination of signals - Grade separation - Traffic signs including VMS and road markings – Significant roles of traffic control personnel - Networking pedestrian facilities & cycle tracks.

Traffic Safety and Environment **[09]**

Road accidents – Causes, effect, prevention, and cost – Street lighting – Traffic and environment hazards – Air and Noise Pollution, causes, abatement measures – Promotion and integration of public transportation – Promotion of non-motorized transport.

Traffic Management **[09]**

Area Traffic Management System - Traffic System Management (TSM) with IRC standards - Traffic Regulatory Measures-Travel Demand Management (TDM) – Direct and indirect methods – Congestion and parking pricing – All segregation methods- Coordination among different agencies – Intelligent Transport System for traffic management, enforcement and education.

Total Hours : 45

Text book(s):

1. Kadiyali L.R, “Traffic Engineering and Transportation Planning” Khanna Publishers, Delhi, 2005.
2. Khanna SK and Justo CEG, “Highway Engineering”, Nem Chand & Bros, Roorkee, 2010.

Reference(s):

1. Jason C.yu, Transportation Engineering: Introduction to Planning, Design and Operations, Elsevier,1992.
2. Taylor M.A.P and Young W,Traffic Analysis-New Technology and New solutions, Hargreen Publishing Company,1998.
3. Partha Chakroborty and Animesh Das,” Principle of Traffic Engineering”, Prentice Hall of India, New Delhi, 2003.
4. Indian Roads Congress (IRC) Specifications: Guidelines and Special Publications on Traffic Planning and Management.

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CO1	2	1	3	1	3	3	1	3		1		1	2	2
CO2	3	1	2	1		2	2	2	2	2	3	2	2	2
CO3	2	2		2	2	3	3	2	3	2	2	3	1	3
CO4	3		3	1	2	2	3	3	2	3		2	3	3
CO5	1	3		1		3	2	2	1	2	1	2	1	3

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K.S.Rangasamy College of Technology – Autonomous								R2018
50 CE E14 - GREEN BUILDINGS								
B.E. CIVIL ENGINEERING								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
V	3	0	0	45	3	50	50	100

Objective(s)	• To learn green building Material and Equipment. • To assess the concept of Green building rating systems. • To acquire knowledge on Water and Energy efficiency in buildings. • To provide introduction to indoor environment quality. • To give exposure on the Sustainability standards and codes
Course Outcomes	**At the end of this course the students will be able to** CO1: Explain the green building materials and key requisites for constructing a green building. CO2: Outline the green building concepts, practices and benefits CO3: Select the suitable HVAC equipment and water efficiency CO4: Discuss the utilization of materials and Indoor environment quality CO5: Summarize the standards and codes for sustainability.

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

Introduction **[09]**

Definition - Green Buildings, Green Building Materials and Equipment in India, key Requisites for Constructing a Green Building, Important Sustainable features for Green Buildings.

Green Building Concepts and Practices **[09]**

Green Building Moment in India, Benefits Experienced in Green Buildings, Various Green building rating system in the Globe & India (LEED, IGBC, GRIHA, Green Globe, Estidama – Pearl rating system), Components of green building.

Energy Efficiency & Water Efficiency **[12]**

Selection of HVAC Equipments (Chiller, Pumps, Air Handling Units), lighting system& its controls, Transformer selection, Eco-friendly captive power generation, Solar Water Heating system and Building Energy Simulation. Water Conservation, Waste water Treatment, Reuse of treated water and water efficient Chillers

Material Selection & Indoor Environment Quality **[09]**

Waste reduction during construction, Waste management during operation, Utilization of materials with recycled content, local materials, material reuse, certified wood, Rapidly renewable building materials and furniture. Tobacco smoke control, Fresh air requirements, Use of Low VOC Materials – Disinfectant of VOC Materials, Measure of IAQ, Reasons for poor IAQ, Measures to achieve Acceptable IAQ levels and IAQ Management

Sustainability Standards and Codes **[06]**

National Building Code (NBC) 2016 – part 11 Approach towards sustainability, Energy Conservation Building Code (ECBC) 2017, ASHRAE Standard 189.1-2014, Standard for the Design of High-Performance Green Buildings.

Total Hours: 45

Text book(s):

1	Jerry yudelson, “Green building A to Z , understanding the buildings”, New society publishers, Canada, 2012
2	Means R S,” Green Building Project Planning and Cost Estimating”, Kingston, Massachusetts, 2011.

Reference(s):

1	Jerry yudelson, “Green building through integrated design”, McGraw Hill, New Delhi, 2010
2	Standard for the design for High Performance Green Buildings by Kent Peterson, 2009
3	Gajanan M Sabnis, “Green Building with Concrete and Sustainable Design and construction, CRC press, 2011
4	Green Building Hand book, Volume I, 2012

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CO1	2	1	3	3	3	3	2	3	3	1		1	2	2
CO2	3	1	2	3	2	2	3	2	2	2	3	2	2	2
CO3	2	2		2	2	3	3	2	3	2	2	3	1	3
CO4	3		3	1	2	2	3	3	3	3	2	2	3	3
CO5	1	3		1		3	2	3	1	2	1	2	1	3

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K.S.Rangasamy College of Technology – Autonomous								R2018
50 CE E15 - Smart Materials and Smart Structures								
B.E. Civil Engineering								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
V	3	0	0	45	3	50	50	100

Objective(s)	• To give an insight into the latest developments regarding smart materials and their use in structures. • To provide exposure with a structure which can self-adjust their stiffness with load. • To gain knowledge and understanding of various aspects of measuring techniques • To Recognize the functioning of sensors, actuators • To apply the concept signal processing and control systems
Course Outcomes	**At the end of this course the students will be able to** 1. Discriminate the functions and response of instrumented structures and the role of effectors and actuators in smart structures. 2. Apply the concept of Whetstone Bridge in strain measurement and describe the strain measuring techniques using electrical strain gauges 3. Differentiate the Piezoelectric and Electro strictive Material in smart structures. 4. Outline the applications of sensors and actuators in smart structures. 5. Apply the concepts of data acquisition and signal processing in smart structure to minimize the realistic engineering constraint

INTRODUCTION

Introduction to Smart Materials and Structures – Instrumented structures functions and response – Sensing systems – Self-diagnosis – Signal processing consideration – Actuation systems and effectors. Application for smart structures. **[09]**

MEASURING TECHNIQUES

Strain Measuring Techniques using Electrical strain gauges, Types – Resistance – Capacitance – Inductance – Wheatstone bridges – Pressure transducers – Load cells – Temperature Compensation – Strain Rosettes. **[09]**

SENSORS

Technology – Types of Sensors – Physical Measurement using Piezo Electric Strain measurement – Inductively Read Transducers – The LVDT – Fiber optic Techniques. Chemical and Bio-Chemical sensing in structural Assessment – Absorptive chemical sensors – Spectroscopes – Fibre Optic Chemical Sensing Systems and Distributed measurement. **[09]**

ACTUATORS

Actuator Techniques – Actuator and actuator materials – Multiplexing embedded NiTiNDL actuators. Piezoelectric and Electrostrictive Material – Magnetostructure Material – Shape Memory Alloys – Electro orheological Fluids– Electromagnetic actuation – Role of actuators and Actuator Materials. Vibration control through shape memory alloys. **[09]**

SIGNAL PROCESSING AND CONTROL SYSTEMS

Data Acquisition and Processing – Signal Processing and Control for Smart Structures – Sensors as Geometrical Processors – Signal Processing – Control System – Linear and Non-Linear. Case studies of smart structures. **[09]**

Total Hours: 45

Text book(s):

1	Brain Culshaw. “Smart Structure and Materials”, Artech House – Borton. London-2015.
2	Srinivasan A.V, D.Michacl Mc Farland., “Smart Structures”, Cambridge University Press, New Delhi 2010.

Reference(s):

1	Srinath S., “Experimental Stress Analysis”, Tata McGraw-Hill, New Delhi, 2010.
2	Dally J.W & Riley W.F., “Experimental Stress Analysis”, Tata McGraw-Hill, New Delhi, 2002.
3	Clarence W. de Silva.,“Sensors and Actuators” Taylor & Francis, 2015
4	Data Acquisition and Signal Processing for Smart Sensors.,Nikolay V. Kirianaki, Wiley, 2002

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COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	3	3	2	3	2	3	3	1	3	3
CO2	2	2	3	2	3	2	2	3	3		1		2	2
CO3	2	2	3	2	2	2	2	2	3	1		1	3	3
CO4	2	2	2	3	3	2	3	3	2	1		3	2	2
CO5	3	3	3	2	2	3	2	2	3	2	3	1	2	3

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K.S.Rangasamy College of Technology – Autonomous								R2018
50 CE E21 - Municipal Solid Waste Management								
B.E. Civil Engineering								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VI	3	0	0	45	3	50	50	100

Objective(s)	• To know the municipal solid waste sources, characteristics and their effects. • To gain knowledge on on-site storage and processing techniques. • To develop basic understanding about collection and transfer of municipal solid wastes. • To learn the on-site and off-site processing techniques on municipal solid wastes. • To understand the disposal methods of municipal solid wastes..
Course Outcomes	**At the end of this course the students will be able to** CO1: Identify the sources, characteristics, impacts and management strategies of municipal solid wastes. CO2: Describe the on-site storage and processing methods. CO3: Summarize the methods of collection and transport of municipal solid wastes. CO4: Outline the off-site processing techniques & equipments. CO5: Explain the disposal methods of municipal solid wastes.

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

Sources and Types of Municipal Solid Wastes

Sources and types of solid wastes - Quantity – factors affecting generation of solid wastes; characteristics – methods of sampling and characterization – Effects of improper disposal of solid wastes – public health and environmental effects – elements of solid waste management – social and economic aspects – Public awareness – Role of NGOs – Municipal solid waste (M & H) rules. **[09]**

On-Site Storage & Processing

On-site storage methods – Effects of improper storage – materials used for containers – on-site segregation of solid wastes – public health & economic aspects of storage – On-site processing methods – Critical evaluation – options under Indian conditions. **[09]**

Collection and Transfer

Methods of residential and commercial collection – types of vehicles – Manpower – collection routes – Analysis of collection systems – Transfer stations – Selection of location – operation and maintenance – Options under Indian conditions – Modern tools for collection and transport systems. **[09]**

Off-Site Processing

Objectives of processing – Processing techniques and Equipment – Resource recovery from solid wastes – composting, biomethanation, incineration, and pyrolysis – Case studies under Indian conditions. **[09]**

Disposal

Land disposal of solid waste – sanitary landfills – site selection, design and operation of sanitary landfills – Landfill liners – Management of landfill leachate and gas – Bio Reactor Land Fill - Dumpsite rehabilitation. **[09]**

Total Hours: 45

Text book(s):

1	George Tchobanoglous and Frank Kreith “Handbook of Solid Waste Management”, McGraw-Hill, New York, 2002.
2	T V Ramachandra, “Management of Municipal Solid Waste”, TERI press, New Delhi, 2014.

Reference(s):

1	Manual on Municipal Solid Waste Management, CPHEEO, Ministry of Housing and Urban affairs, Government of India, New Delhi, 2016.
2	A D Bhide and B B Sundaresan, “Solid Waste Management in Developing Countries”, Indian National Scientific Documentation Centre, 2010.
3	A G R Manser and A A Keeling, “Practical Handbook of Processing, Recycling of Municipal Solid Wastes”, Lewis Publishers, 1996.
4	M N Rao, Razia Sultana and Sri Harsha Kota, “Solid and Hazardous Waste Management”, Elsevier, 2016.

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Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	1	1	1	3	3	1		1	1		2	2
CO2	3	2		1		2	2			1	1		2	1
CO3	3	2	2	1		2	1			1	1		2	2
CO4	3	2		1		2	2			1	1		2	1
CO5	3	2	2	1		3	3	1		1	1		2	2

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K.S.Rangasamy College of Technology – Autonomous								R2018
50 CE E22- Repair and Rehabilitation of Structures								
B.E. Civil Engineering								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VI	3	0	0	45	3	50	50	100

Objective(s)	• To impart broad knowledge in the area of repair and rehabilitation of structures • To gain knowledge on quality of concrete and durability aspects • To understand the properties of repair materials • To obtain the knowledge about corrosion of structures • To know the causes of deterioration and assessment of distressed structures
Course Outcomes	**At the end of this course the students will be able to** 1. Develop the Knowledge about assessment procedure for evaluating a damaged structures. 2. Demonstrate the various types of distress in concrete structures 3. Identify the best Materials and Techniques for Repair. 4. Describe corrosion protection techniques and forensic engineering. 5. Summarise the demolition techniques carried out for a structure.

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

Maintenance and Repair Strategies

Definition - Maintenance, Repair, Rehabilitation, Retrofitting. Need for rehabilitation, Importance of maintenance, Facts of maintenance, Various aspects of inspection, Assessment procedure for evaluating a damaged structures, Causes and deterioration of concrete. **[09]**

Serviceability and Durability Of Concrete

Quality assurance for concrete construction, Need for quality assurance, Concrete properties-Strength, Permeability, Thermal Properties, Cracks - Types, Causes and Effects due to cracking, Effect duo to climate, Temperature, Corrosion, Chemicals, Effects of cover thickness Design and construction Errors. **[09]**

Materials and Testing Techniques

Criteria for material selection - Methodology of selection. Special concretes - Polymer concrete, Sulphur infiltrated concrete, Fiber reinforced concrete, High strength concrete, High performance concrete, Vacuum concrete, Self-compacting concrete. Special cement - Expansive cement and Ferro cement. Destructive and Non-destructive testing techniques. **[09]**

Techniques for Repair and Forensic Engineering

Crack repair techniques – Stitching, Routing and sealing, Resin injection, Dry packing, Polymer impregnation, Vacuum impregnation, Autogenous healing, Flexible sealing, Drilling and plugging, Bandaging. Repair distressed due to corrosion, wear, fire, leakage and marine exposure. Methods of corrosion protection - Corrosion inhibitors, Corrosion resistant steels, Reinforcement coating Cathodic protection and Rust eliminators. Forensic engineering – Introduction, Failure of structures, Review of construction theory, Performances problems, Responsibility and accountability, Learning from failure – carbon Wrapping. **[09]**

Rehabilitation and retrofitting of Structures and Demolition Techniques

Strengthening of superstructure - Plates, Conversation to composite construction, Post stressing, Jacketing, Bonded overlays, Reinforcement addition. Strengthening of substructures - Shoring and Underpinning. Engineered demolition techniques- demolition process, selection of techniques–Case studies. **[09]**

Total Hours: 45

Text book(s):

1	Dr.K.Gunasekaran and Dr.J.S.Sudarsan., “Repair and Rehabilitation of structures”, ARS Publications. Chennai, 2019.
2	Dr.B.Vidivelli., “Rehabilitation of Concrete Structures”, Standard Publishers Distributiors.Delhi, Reprint 2018

Reference(s):

1	CPWD HAND BOOK–“Repair and rehabilitation of R.C.C buildings”, CPWD, Govt. of India, Reprint 2011
2	ACCE(I),Madurai Centre,Workshop on Cracks,Corrosion and Leaks,July,2003
3	Peter.H.Emmons, “Concrete repair and maintenance illustrated”, Galgotia Publications Pvt. Ltd., 2001.Press, 2011
4	Sankar, S.K. and Saraswati, S., Construction Technology, Oxford University. New Delhi, 2008

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CO1	1		3			3	2	1	1		1	2	2	2
CO2	1		3			3	2	1	1		1	2	2	1
CO3	1		3	2		3		1	1		1		2	2
CO4	1		3	2		3	2	1	1		1	2	2	1
CO5	1		3	1		3		1	1		1		2	2

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K.S.Rangasamy College of Technology – Autonomous								R2018
50 CE E23 - Building Services								
B.E. Civil Engineering								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VI	3	0	0	45	3	50	50	100

Objective(s)	• To acquire knowledge on various facilities like lifts and escalators and machinery involved in buildings. • To study the principles of electrical and air conditioning installations. • To gain exposure in Modern theory of lighting. • To improve skills about basic refrigeration principles and applications. • To provide exposure on the principles of fire safety regulations and National Building Code.
Course Outcomes	**At the end of this course the students will be able to** CO1: Discuss the application of hot water boilers, vibrators, motors and concrete mixtures. CO2: Classify the wiring and earthling system. CO3: Describe the modern theory of light and colour in various types of buildings. CO4: Summarize the refrigeration principles and air conditioning systems in buildings. CO5: Infer the causes of fire, fire safety regulation and installation.

MACHINERIES **[09]**

Hot Water Boilers – Lifts and Escalators – Special features required for physically handicapped and elderly – Conveyors – Vibrators – Concrete mixers – DC/AC motors – Generators – Laboratory services – Gas, water, air and electricity.

ELECTRICAL SYSTEMS IN BUILDINGS **[09]**

Basics of electricity – Single / Three phase supply – Protective devices in electrical installations – Earthling for safety – Types of ear thing – ISI specifications – Types of wires, wiring systems and their choice – Planning electrical wiring for building – Main and distribution boards – Transformers and switch gears – Layout of substations.

PRINCIPLES OF ILLUMINATION & DESIGN **[09]**

Visual tasks – Factors affecting visual tasks – Modern theory of light and colour – Synthesis of light – Additive and subtractive synthesis of color – Luminous flux – Candela – Solid angle illumination – Utilization factor – Depreciation factor – MSCP – MHCP – Lanes of illumination – Classification of lighting – Artificial light sources – Spectral energy distribution – Luminous efficiency – Colour temperature – Colour rendering. Design of modern lighting – Lighting for stores, offices, schools, hospitals and house lighting. Elementary idea of special features required and minimum level of illumination required for physically handicapped and elderly in building types.

REFRIGERATION PRINCIPLES & APPLICATIONS **[09]**

Thermodynamics – Heat – Temperature, measurement transfer – Change of state – Sensible heat – Latent heat of fusion, evaporation, sublimation – saturation temperature – Super heated vapor – Sub cooled liquid – Pressure temperature relationship for liquids – Refrigerants – Vapor compression cycle – Compressors – Evaporators – Refrigerant control devices – Electric motors – Starters – Air handling units – Cooling towers – Window type and packaged air-conditioners – HVAC - Chilled water plant – Fan coil systems – Water piping – Cooling load – Air conditioning systems for different types of buildings – Protection against fire to be caused by A.C. Systems.

FIRE SAFETY INSTALLATION **[09]**

Causes of fire in buildings – Safety regulations – NBC – Planning considerations in buildings like non-combustible materials, construction, staircases and lift lobbies, fire escapes and A.C. systems. Special features required for physically handicapped and elderly in building types – Heat and smoke detectors – Fire alarm system, snorkel ladder – Fire lighting pump and water storage – Dry and wet risers – Automatic sprinklers-modern fire safety systems.

Total Hours: 45

Text book(s):

1	Udayakumar R., “Building Services”, Easwar Press, 2009.
2	Srinivasan A.V, D.Michacl Mc Farland., “Smart Structures”, Cambridge University Press, New Delhi ,2010.

Reference(s):

1	National Building Code of Practice, Bureau of Indian Standard, 2005.
2	Philips. “Lighting in Architectural Design”, McGraw-Hill, New York, 1997.
3	William H.Severns and Julian R.Fellows., “Air-conditioning and Refrigeration”, John Wiley and Sons, London, 1988.
4	A.F.C.Sherratt, “Air-conditioning and Energy Conservation”, The Architectural Press, London,. 1980

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CO1	2	3	2	3	1		3		1	3	1	2	2	2
CO2	1	2	2	3	3	1	1	2					3	2
CO3	1		3	1	3	2	1		3	1	2	1	2	2
CO4	2	1		2		2	2	1	2	1	1	2	2	3
CO5	2	3	2	1	2	2		2	1	2	1	1	2	3

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K.S.Rangasamy College of Technology – Autonomous								R2018
51 CE E24 - Geo Environmental Engineering								
B.E. Civil Engineering								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VI	3	0	0	45	3	50	50	100

Objective(s)	• To provide an exposure to the geotechnical nature of environmental problems. • To impart knowledge in the selection of sites for waste disposal using current methodologies. • To understand the soil waste interaction, based on the properties of soil • To evaluate the impact of pollution on soil properties, need for landfill and design concepts of land fill. • To analyse and identify the contaminated soil by various methods.
Course Outcomes	**At the end of this course the students will be able to** 1. Describe various types of soil pollutant. 2. Evaluate of engineering properties and treatment. 3. Compute the deflection of beams by different methods and selection of method for determining slope or deflection. 4. Describe the remediation of hazardous waste. 5. Analyze the various detecting and testing methods for soil.

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

Soil- Pollutant Interaction

Introduction to geo environmental engineering – environmental cycle – sources, production and classification of waste – causes of soil pollution – factors governing soil-pollutant interaction- Physico-chemical behavior and modelling - failures of foundations due to pollutants. **[09]**

Soil waste interaction

contaminant transport - advective, diffusive, dispersive and combined process - attenuation capacity- change in engineering properties; permeability, shear strength, Atterbergs limit, compressibility and swell. Soil remediation- soil washing, fixation, electrokinetic remediation, biological treatment, thermal treatment and containment. **[09]**

Selection of Sites

Criteria for selection of sites for wastes disposal current methodologies for waste disposal, Sub surface disposal techniques, Passive containment Systems, Leachate movement, application of geomembranes and other techniques in solid and liquid waste disposal. Landfill – Types and design. **[09]**

Remediation of Hazardous Waste

Hazardous waste control and storage system – stabilization / solidification of waste, Monitoring and performance of waste facilities – safe disposal of solid and Dynamic response of soil under environmental stress. **[09]**

Detecting and Testing methods

Methodology – current soil testing methods – approach for characterization and identification of contaminated ground soil for engineering purposes. Case studies of Contaminated Sites. **[09]**

Total Hours: 45

Text book(s):

1	Lakshmi Reddi, Hilary I. Inyang, “Geoenvironmental Engineering: Principles and Applications”, CRC Press, New York, 2012.
2	Hsai-Yang Fang, “Introduction to Environmental Geotechnology”, CRC Press, New York,2009

Reference(s):

1	Wentz, C.A., “Hazardous Waste Management”, McGraw Hill, Singapore,2006
2	Ott, W.R., “Environmental Indices”, Theory and Practice, Ann, Arbor, 2008.
3	Raymond N. Yong, “Geoenvironmental Engineering: Contaminated Soils, Pollutant Fate, and Mitigation, CRC Press, New York,2000.
4	Fair. G.M., Geyer.J.C., "Water Supply and Wastewater Disposal", John Wiley and Sons, 2014

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CO1	1	2		3	3					2		1	2	3
CO2						3							2	3
CO3	1	3	2				2		1		1		2	3
CO4	1		2		3				2			2	2	3
CO5	2	1		1	2			2		1			2	1

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K.S.Rangasamy College of Technology – Autonomous								R2018
50 CE E25 - Probability and Random Variables								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VI	3	0	0	45	3	50	50	100

Objective(s)	• To acquire skills in the concepts of probability. • To acquire knowledge in handling situations involving random variables. • To provide an understanding of the statistical methods by which real life problems are analyzed. • To construct an appropriate model using time series approach. • To know the utilization of nonparametric tests in engineering discipline.
Course Outcomes	**At the end of the course, the students will be able to** CO1: Interpret the concepts of probability and the properties of a random variables. CO2: Apply the properties of discrete and continuous random variables with their joint, marginal and conditional distributions and to analyze the average relationship between two characteristics. CO3: (i) Discuss the concepts of basic measures of central tendency. (ii) Acquire the knowledge to draw the different types of diagrams for the given statistical events. CO4: Illustrate the components of time series and suitable methods for measuring seasonal variations in time series. CO5: Apply sign, Mann – Whitney and Kruskal – Wallis H tests for testing the hypothesis about parent population

Probability And Random Variable **[09]**

Axioms of probability – Conditional probability – Total probability – Baye's theorem – Random variable – Probability mass function – Probability density functions – Properties – Moments – Moment generating functions and their properties.

Two Dimensional Random Variables **[09]**

Joint distributions - Marginal and conditional distributions – Covariance - Correlation and regression - Transformation of random variables - Central limit theorem.

Statistics **[09]**

Measures of Central Tendency – Mean, Median, Mode – Measures of Dispersion – Quartile deviation, Standard deviation – Coefficient of Variation – Frequency Distribution – Histogram – Frequency Polygon – Ogive Curve – Pie Diagram.

Time Series **[09]**

Components of a time series – Method of least square – Parabolic trend – Exponential trend – Method of seasonal variations – Ratio to trend method – Ratio to moving average method – Link relative method.

Nonparametric Tests **[09]**

Introduction – The sign test - The Mann – Whitney U test – The Kruskal – Wallis H test - The H test corrected for ties – The runs test for Randomness.

Total Hours: 45

Text book (s):

1	S C Gupta and V K Kapoor, "Fundamentals of Mathematical Statistics", S Chand & Company Ltd,11th Edition, 2007.
2	P N Aroraand S Arora, "Statistics for Management", S. Chand &Company Ltd, 2007.

Reference (s):

1	T Veerarajan, "Probability, Statistics and Random Process", Tata McGraw-Hill Publishing Company Ltd, 3rd Edition, 2011.
2	M R Spiegel, J Schiller and R ASrinivasan, "Schaum's Outline of Theory and Problems of Probability and Statistics",Tata McGraw-Hill Publishing Company Ltd,2nd Edition, 2004.
3	S M Ross,"Introduction to Probability and Statistics for Engineers and Scientists",Elsevier,3rd Edition, 2004.
4	O D Anderson, "Time series Analysis: Theory and Practice", I.North-Holland, Amsterdam, 1982.

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CO1	3	3	3	3	2						2	2	3	
CO2	3	3	3	3	2						2	2	3	
CO3	3	3	3	3	2						2	2	3	
CO4	3	3	3	3	2						2	2	3	
CO5	3	3	3	3	2						2	2	3	

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K.S.Rangasamy College of Technology – Autonomous								R2018
50 CE E31 Prefabricated Structures								
B.E.Civil Engineering								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	50	50	100

Objective(s)	• To impart knowledge on prefabricated elements and the technologies used for fabrication and erection • To impart knowledge on the applications of prefabricated elements in construction
Course Outcomes	**At the end of this course the students will be able to** CO1: The student will have good knowledge about design principles, layout of factory and stages of loading in precast construction. CO2: Acquire knowledge about panel systems, slabs, connections used in precast construction and they will be in a position to design the elements. CO3: Acquire knowledge about types of floor systems, stairs and roofs used in precast construction. CO4: Acquire knowledge about design of joints. CO5:Acquire knowledge about design of building for abnormal loads.

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

INTRODUCTION

Need for prefabrication – Principles – Materials – Modular coordination – Standarization – Systems – Production – Transportation – Erection. [9]

PREFABRICATED COMPONENTS

Behaviour of structural components – Large panel constructions – Construction of roof and floor slabs – Wall panels – Columns – Shear walls [9]

DESIGN PRINCIPLES

Disuniting of structures- Design of cross section based on efficiency of material used – Problems in design because of joint flexibility – Allowance for joint deformation. [9]

JOINT IN STRUCTURAL MEMBERS

Joints for different structural connections – Dimensions and detailing – Design of expansion joints [9]

DESIGN FOR ABNORMAL LOADS

Progressive collapse – Code provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., - Importance of avoidance of progressive collapse. [9]

Total Hours: 45

Text book(s):

1	Gerostiza. C.Z., Hendrikson, C., Rehat D.R., “Knowledge Based Process Planning for Construction and Manufacturing”, Academic Press, Inc., 2002.
2	Ritwa, “Structural design manual, Precast concrete connection details”, Society for the studies in the use of precast concrete, Netherland Betor Verlag, 2001.

Reference(s):

1	L. Mokk, Prefabricated Concrete for Industrial and Public Structures, Publishing House of the Hungarian Academy of Sciences, Budapest, 2007.
2	Structural Design Manual, Precast Concrete Connection Details, Society for the Studies in the use of Precast Concrete, Netherland Betor Verlag, 2009
3	B. Lewicki, Building with Large Prefabricates, Elsevier Publishing Company, Amsterdam, London, New York, 1998.
4	“Handbook on Precast Concrete Buildings”, Indian Concrete Institute, 2016.

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CO1	2	1		1		2	2	1			2		3	3
CO2	3			2		3	2				2		3	2
CO3	1		3			2		1			1	1	1	2
CO4	3			2		3	2						1	1
CO5			3			1		1			3	1	2	2

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TIRUCHENGODE - 637 215

K.S.Rangasamy College of Technology – Autonomous								R2018
51 CE E32- Ground Improvement Techniques								
B.E.Civil Engineering								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	50	50	100

Objective(s)	• To learn the fundamental concepts of Stress, Strain and soil Conditions. • To know Treatment of various soil conditions. • To evaluate the behavior of stabilization of soil.
Course Outcomes	**At the end of this course the students will be able to** 1. Understand various types of ground improvement. 2. Solve the dewatering techniques. 3. Compute the Dynamic compaction Vibroflotation. 4. Describe the various methods of grouting for treated. 5. Analyze the Soil improvement by adding materials.

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

Weak Soil And Improvement Techniques

Role of ground improvement in foundation engineering – methods of ground improvement – Geotechnical problems in alluvial, lateritic and black cotton soils – Selection of suitable ground improvement techniques based on soil conditions Reclaimed soil for the land reclamation.

. **[09]**

Dewatereing

Dewatering Techniques – Well points – Vacuum and electroosmotic methods – Seepage analysis for two – dimensional flow for fully and partially penetrated slots in homogeneous deposits – Simple cases – Design. **[09]**

Insitu Treatment of Cohesionless and Cohesive Soils

Insitu densification of cohesion-less soils and consolidation of cohesive soils: Dynamic compaction Vibroflotation, Sand compaction piles and deep compaction. Consolidation: Preloading with sand drains, and fabric drains, Stone columns and Lime piles-installation techniques – simple design – relative merits of above methods and their limitations. **[09]**

Grouting

Chemical, systems, operations, applications, compaction, application and limitations, plant for preparing grouting materials, jet, geometry and properties of treated soils and applications. **[09]**

Stabilization

Soil improvement by adding materials, lime, flyash, cement and other chemicals and bitumen, sand column, stone column, sand drains, prefabricated drains, lime column, soil lime column, stabilization of soft clay or silt with lime, bearing capacity and settlement of treated soils, improvement in slope stability, control methods. Soil Structure Interaction and Nailing Techniques

[09]

Total Hours: 45

Text book(s):

1	Raj, P.P. Ground improvement techniques, Laxmi Publications, New Delhi
2	P. Purushothama Raj, Ground improvement techniques, Laxmi Publications, Bangalore.

Reference(s):

1	Civil Engineering and Construction Review, Foundations Geosynthetics and ground improvement, Civil Engineering and Construction Review, New Delhi.
2	Koerner R.M., "Construction and Geotechnical Methods in Foundation Engineering", McGraw-Hill, 1994
3	Jones J.E.P., Earth Reinforcement and Soil Structure, Butterworths, 1995.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3		1	3	2			2		3			1	2
CO2		1		3	2							2	1	2
CO3		2			1		1			2			1	2
CO4		3	1		2				2		2		2	2
CO5	2	1			3		1	1		3		1	2	2

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K.S.Rangasamy College of Technology – Autonomous								R2018
50 CE E33- Bridge Engineering								
B.E.Civil Engineering								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	50	50	100

Objective(s)	• To learn the fundamental concepts of Construction of Bridges. • To know composite bridge structures. • To evaluate the substructure under various soil conditions.
Course Outcomes	**At the end of this course the students will be able to** CO1: Understand various types of bridges. CO2: Improve the software techniques for various load conditions. CO3: Compute the analysis and design of bridges. CO4: Describe the various methods of foundation for bridges. CO5: Evaluate the long span bridge design and construction.

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

Introduction:

Types of bridges - Materials of construction - Codes of practice (Railway and Highway Bridges) - Aesthetics - Loading standards (IRC, RDSO, AASHTO) - Recent developments box girder bridges - Historical bridges (in India and overseas). Planning and layout of bridges: Hydraulic design - Geological and geotechnical considerations - Design aids - Computer softwares- Expert systems. **[09]**

Concrete bridges

Bridge deck and approach slabs - Slab design methods - Design of bridge deck systems - Slab-beam systems (Guyon- Massonet and Hendry Jaeger methods) - Box girder systems - Analysis and design - Detailing of box girder systems. **[09]**

Steel and composite bridges:

Introduction to composite bridges - Advantages and disadvantages - Orthotropic decks - Box girders - Composite steel-concrete bridges - Analysis and design - Truss bridges – Construction methods of Slab culverts, Simply supported bridges and cantilever bridges. **[09]**

Sub-structure

Piers - Columns and towers - Analysis and design - Shallow and deep foundations - Caissons - Abutments and retaining walls. Bridge appurtenances: Expansion joints - Design of joints - Types and functions of bearings - Design of elastomeric bearings - Railings - Drainage system - Lighting. **[09]**

Long span bridges:

Design principles of continuous box girders - Curved and skew bridges - Cable stayed and suspension bridges - Seismic resistant design - Seismic isolation and damping devices. Construction techniques: Cast in-situ - Prefabricated - Incremental launching - Free cantilever construction - Inspection - Maintenance and rehabilitation - Current design and construction practices. **[09]**

Total Hours = 45 hours

Text book(s):

1	Wai-Fah Chen Lian Duan, "Bridge Engineering Handbook", CRC Press, USA, 2000.
2	R.M. Barker and J.A. Puckett, “Design of Highway Bridges”, John Wiley & Sons, New York, 1997

Reference(s):

1	P.P. Xanthakos, "Theory and Design of Bridges", John Wiley & Sons, New York, 1994
2	D.J. Victor, “Essentials of Bridge Engineening,” Oxford & IBH Publishing, New Delhi, 2001
3	N. Krishna Raju, “Design of Bridges,” Oxford & IBH Publishing, New Delhi, 1998.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3	2	3		2			3	2		3		2	3
CO2		2				2	1				3		2	3
CO3	2	2	1		1		2	2		1			2	3
CO4		3	1		3				2		3		2	3
CO5	3	2		2	3		2						2	3

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K.S.Rangasamy College of Technology – Autonomous								R2018
50 CE E34 Air Pollution Management								
B.E. Civil Engineering								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	50	50	100

Objective(s)	• To understand the nature and characteristics of air pollutants, noise pollution and basic concepts of air quality management. • To know the pollutant dispersion concepts and computer models. • To design stacks and particulate air pollution control devices to meet applicable standards. • To manage the air pollution through preventive measures and impact assessment. • To identify, formulate and solve air and noise pollution problems
Course Outcomes	**At the end of this course the students will be able to** CO1: Define the sources of air pollution and sampling methods. CO2: Describe the dispersion of air pollutants. CO3: Express the particulate and gaseous pollutant control techniques. CO4: Summarize the air quality management principles. CO5: Evaluate the indoor air quality and noise pollution effects.

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

Sources and Effects of Air Pollutants

Classification of air pollutants – Particulates and gaseous pollutants – Sources of air pollution – Source inventory – Effects of air pollution on human beings, materials, vegetation, animals – global warming-ozone layer depletion, Sampling and Analysis – Basic Principles of Sampling – Source and ambient sampling – Analysis of pollutants – Principles-air pollution episodes. **[09]**

Dispersion of Pollutants

Elements of atmosphere – Meteorological factors – Wind roses – Lapse rate – Atmospheric stability and turbulence – Plume rise – Dispersion of pollutants – Dispersion models – Software applications. **[09]**

Air Pollution Control

Concepts of control – Principles and design of control measures – Particulates control by gravitational, centrifugal, filtration, scrubbing, electrostatic precipitation – Selection criteria for equipment - gaseous pollutant control by adsorption, absorption, condensation, combustion – Pollution control for specific major industries. **[09]**

Air Quality Management

Air quality monitoring – Preventive measures - Air pollution control efforts – Zoning – Town planning regulation of new industries – Legislation and enforcement – Environmental Impact Assessment -Air pollution management in Indian cities. **[09]**

Indoor air quality and Noise Pollution

Sources types and control of indoor air pollutants, sick building syndrome types – Radon Pollution and its control, Sources of noise pollution – Effects – Assessment - Standards – Control methods – Prevention. **[09]**

Total : 45 hours

Text book(s):

1	Anjaneyulu, Y., “Air pollution: Prevention and Control Technologies”, BS Publications, Hyderabad, 2020.
2	Rao M.N. and Rao H. V. N., “Air Pollution Control”, Tata-McGraw-Hill, New Delhi, 2017.

Reference(s):

1	W.L.Heumann., “Industrial Air Pollution Control Systems”, McGraw-Hill, New York, 2001.
2	Mahajan S.P., “Pollution Control in Process Industries”, Tata McGraw-Hill Publishing Company, New Delhi, 2001.
3	Noel De Nevers, “Air Pollution Control Engineering”, Waveland Press Inc., Illinois, 2016.
4	Bhatia, S.C., “Textbook of Air Pollution and its Control”, Atlantic Press, New Delhi, 2010.

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Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1		1		2	2			1			2	1
CO2	3	2	2	2		2	3			1			2	2
CO3	3	2	2	2		2	3			1			2	2
CO4	3	1				2	3	1		2			2	3
CO5	3	1				2	2			1			2	1

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K.S.Rangasamy College of Technology – Autonomous								R2018
50 CE E35 Airport, Docks and Harbours								
B.E. Civil Engineering								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	50	50	100

Objective(s)	• To learn skills on airport planning and design with the prime focus on runway and taxiway geometrics. • Acquire knowledge on site reconnaissance for location and planning of harbours.
Course Outcomes	**At the end of this course the students will be able to** CO1: Plan a airport with a concepts and location CO2: Develop a site selection for a air traffic control CO3: Model the geometrics of the elements of airport and functions of terminal building CO4: Select the suitable area for the harbor and port for transport. CO5: Build a coastal area for the maintenance in the dredging purposes

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

Airport Planning

Regional planning-concepts and advantages, location and planning of airport elements-airfield, terminal area, obstructions, approach zone, zoning laws, airport capacity, airport size and site selection, estimation of future air traffic, development of new airport, requirements of an ideal airport layout. Role of Air Transport, Components of Airports - Airport Planning – Air traffic potential, Site Selection, Design of Components, Cost Estimates, Evaluation and Institutional arrangements **[09]**

Airport Design

Run Way Design-Wind rose and orientation of runway, factors affecting runway length, basic runway length, and corrections to runway length, runway geometrics and runway patterns (configurations). Taxiway Design-Controlling factors, taxiway geometric elements, layout, exit taxiway, location and geometrics, holding apron, turnaround facility. Aprons - locations, size, gate positions, aircraft parking configurations and parking systems, hanger-site selection, planning and design considerations, Fuel storage area, blast and erosion control. Terminal Area Design-Terminal area elements and requirements, terminal building functions, space requirements, location planning concepts, vehicular parking area and circulation network. **[09]**

Airport Layouts, Visual Aids, and Air Traffic Control

Airport Layouts – Apron, Terminal Building, Hangars, Motor Vehicle Parking Area and Circulation Pattern, Case studies of Airport Layouts - Airport Buildings – Primary functions, Planning Concept, Principles of Passenger Flow, Passenger Facilities - Visual Aids – Runway and Taxiway Markings, Wind Direction Indicators, Runway and Taxiway Lightings - Air Traffic Control – Basic Actions, Air Traffic Control Network - Helipads, Hangars, Service Equipments. **[09]**

Harbour Engineering

Definition of Terms - Harbours, Ports, Docks, Tides and Waves, Littoral Drift, Sounding, Area, Depth, Satellite Ports - Requirements and Classification of Harbours - Site Selection & Selection Investigation – Speed of water, Dredging, Range of Tides, Waves and Tidal Currents, Littoral Transport with Erosion and Deposition, Soundings, Anchoring Grounds, Geological Characteristics, Winds & Storms, Position and Size of Shoals - Shore Considerations- Proximity to Towns/Cities, Utilities, Construction Materials, Coast Lines Coastal Shipping, Inland Water Transport and Container Transportation.Maintenance- Costal protection-purpose and devices, dredging-capital and maintenance dredging, purpose, methods, dredgers-types, suitability, disposal of dredged material. **[09]**

Marine and Dock Engineering

Marine - General design aspects, breakwaters - function, types general design principles, wharves, quays, jetties, piers, pier heads, dolphin, fenders, mooring accessories- function, types, suitability, design and construction features.Docks - Functions and types - dry docks, wet docks – form and arrangement of basins and docks – design and construction – dock entrances - floating dry docks, slip ways, dock entrances and caissons. Dredging – functions - general study of dipper dredger, grapple dredger, ladder dredger and hydraulic dredger. **[09]**

Total : 45 hours

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Text book(s):	
1	Khanna S K, Arora M G and Jain S S, Airport Planning and Design, Nemchand and Brothers, Roorkee, 1994.
2	S P Bindra, A Course in Docks and Harbour Engineering, Dhanpat Rai and Sons, New Delhi, 1993.
Reference(s):	
1	Rangwala, Airport Engineering, Charotar Publishing House, 1996.
2	Oza.H.P. and Oza.G.H., “A course in Docks & Harbour Engineering”. Charotar Publishing Co.1976.
3	Horonjeff, “Planning and design of Airports”, Mc Graw Hill

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1			1			2	3	2	1	1	2	1	2	1
CO2			1			2	3	2	1	1	2	1	2	2
CO3			1			2	3	2	1	1	2	1	2	2
CO4			1			2	3	2	1	1	2	1	2	3
CO5			1			2	3	2	1	1	2	1	2	1

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K.S.Rangasamy College of Technology - Autonomous								
50 CE E41 TALL STRUCTURES								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VII	2	0	2	45	3	50	50	100

Objective(s)	1. The design aspects and analysis methodologies of tall buildings will be introduced. 2. To learn principles of stability of tall buildings 3. To evaluate the performance of tall structures for strength and stability 4. The problems associated with large heights of structures with respect to loads (wind and earthquake and deflections of the structure). 5. Gain the rudimentary principles of designing tall buildings as per the existing course.
Course Outcomes	**At the end of this course the students will be able to** 1. Introduce various systems of tall buildings. 2. Know about different types of loads, materials and design philosophy. 3. Analyze and design of tall structural systems including structural connections. 4. Analyze the behavior of tall buildings subjected to lateral loading 5. Analyze tube in tube construction and three dimensional analysis of shear core buildings

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

INTRODUCTION **[9]**

The Tall Building in the Urban Context - The Tall Building and its Support Structure - Development of High Rise Building Structures - General Planning Considerations. Dead Loads - Live Loads-Construction Loads -Snow, Rain, and Ice Loads - Wind Loads-Seismic Loading –Water and Earth Pressure Loads - Loads - Loads Due to Restrained Volume Changes of Material - Impact and Dynamic Loads - Blast Loads -Combination of Loads.

THE VERTICAL STRUCTURE PLANE **[9]**

Dispersion of Vertical Forces- Dispersion of Lateral Forces - Optimum Ground Level Space - Shear Wall Arrangement - Behaviour of Shear Walls under Lateral Loading. The Floor Structure or Horizontal Building Plane Floor Framing Systems-Horizontal Bracing- Composite Floor Systems The High - Rise Building as related to assemblage Kits Skeleton Frame Systems - Load Bearing Wall Panel Systems - Panel – Frame Systems - Multistory Box Systems.

COMMON HIGH-RISE BUILDING STRUCTURES AND THEIR BEHAVIOUR UNDER LOAD **[9]**

The Bearing Wall Structure- The Shear Core Structure - Rigid Frame Systems- The Wall - Beam Structure: Interspatial and Staggered Truss Systems - Frame - Shear Wall Building Systems - Flat Slab Building Structures - Shear Truss - Frame Interaction System with Rigid - Belt Trusses - Tubular Systems-Composite Buildings - Comparison of High - Rise Structural Systems Other Design Approaches Controlling Building Drift Efficient Building Forms - The Counteracting Force or Dynamic Response.

APPROXIMATE STRUCTURAL ANALYSIS AND DESIGN OF BUILDINGS **[9]**

Approximate Analysis of Bearing Wall Buildings The Cross Wall Structure - The Long Wall Structure The Rigid Frame Structure Approximate Analysis for Vertical Loading - Approximate Analysis for Lateral Loading - Approximate Design of Rigid Frame Buildings-Lateral Deformation of Rigid Frame Buildings The Rigid Frame - Shear Wall Structure - The Vierendeel Structure - The Hollow Tube Structure.

OTHER HIGH-RISE BUILDING STRUCTURE **[9]**

Deep - Beam Systems - High-Rise Suspension Systems - Pneumatic High -Rise Buildings - Space Frame Applied to High - Rise Buildings - Capsule Architecture.

Total Hours: 45

Text book (s):

1	Wolfgang Schueller ., “High - Rise Building Structures", John Wiley and Sons, 2001.
2	Bryan Stafford Smith and Alexcoull., “Tall Building Structures - Analysis and Design”, John Wiley and Sons, Inc., 2006.

Reference (s) :

1	Coull, A. and Smith, Stafford, B. “Tall Buildings”, Pergamon Press, London, 2003
2	LinT.Y. and Burry D.Stotes., “Structural Concepts and Systems for Architects and Engineers", John Wiley, 1994.
3	Lynn S.Beedle., “Advances in Tall Buildings”, CBS Publishers and Distributors, Delhi, 2001.
4	Taranath.B.S., “Structural Analysis and Design of Tall Buildings”, Mc Graw Hill, New York, 2011.

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Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1				1		1					3	2	2	1
CO2				1		1					3	2	2	2
CO3	1		1	1		1					3	2	2	2
CO4	1		1	1	2	1					3	2	2	3
CO5	1		1	1	2	1					3	2	2	1

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K.S.Rangasamy College of Technology – Autonomous								R2018
50 CE E42 – Quality Control and Assurance								
B.E. Civil Engineering								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VIII	2	0	2	45	3	50	50	100

Objective(s)	• To study the individual responsibility in acquiring construction quality, standards and documents to be maintained for quality • To learn the scope of quality certifications applicable to construction industries. • The concepts of Quality control and failure aspects in quality • To study the responsibilities of QA & QC. • To learn about the Quality improvement techniques.
Course Outcomes	**At the end of this course the students will be able to** CO1: Discuss the factors influencing construction quality. CO2: Describe the Quality system, standards and requirements. CO3: Discuss the consumer satisfaction, time of completion and codes standards. CO4: Explain the major failure aspects and failure mode analysis of quality control. CO5: Develop the new material, detailing specification, bid preparation of construction activity.

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

PROJECT QUALITY MANAGEMENT **[9]**

Introduction – Definitions and objectives – Factors influencing construction quality – Responsibilities and authority – Quality plan – Quality Management Guidelines – Quality circles.

QUALITY SYSTEMS **[9]**

Introduction – Quality system standard– Requirements – Preparing Quality System Documents – Quality related training – Implementing a Quality system – Third party Certification.

QUALITY CONTROL ON CONSTRUCTION PROJECTS **[9]**

Quality Policy – Objectives and methods in Construction industry – Consumers satisfaction – Ergonomics – Time of Completion – Statistical tolerance –Taguchi's concept of quality – Codes and Standards – Documents – Contract and construction programming – Inspection of reinforced concrete – Masonry and steel works – Testing techniques and quality at reports.

QUALITY ASSURANCE AND CONTROL **[9]**

Objectives – Techniques and needs of QA/QC – Different aspects of quality – Appraisals – Factors influencing construction quality – Critical – Six sigma – Introduction – Tools – Process - Major failure aspects and failure mode analysis – Stability methods and tools – Optimum design.

QULAITY IMPROVEMENT TECHNIQUES **[9]**

Selection of new materials – Influence of drawings – Detailing – Specification – Standardization – Bid preparation – Construction activity – Environmental safety – Social and Environmental factors – Natural causes and speed of construction – Life cycle costing – Value engineering and value analysis.

Total Hours:45 hours

Text book(s):

1	John L Ashford, "The Management of Quality in Construction", E & F.N.Spon, London, 2010
2	James J O , Brian, Construction Inspection Handbook –Total Quality Management, Van Nostrand, New Delhi, 2011

Reference(s):

1	Hutchins.G, ISO 9000 : A Comprehensive Guide to Registration, Audit Guidelines and Successful Certification, Viva Books Pvt. Ltd., 1994.
2	Juran Frank.J M Gryna F M, "Quality Planning and Analysis", McGraw Hill, New Delhi, 2009
3.	Kwaku A., Tenah and Jose M.Guevera, "Fundamental of Construction Management and Organization ", Prentice Hall of India, 1995.
4.	Steven Mccabe, "Quality Improvement Techniques in Construction", Routledge, UK, 2016

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CO1	1	1	2	3	1	2	3	1	1	3	1		3	1
CO2	2	1	1	1	1	2	2	2	1	1		1	2	3
CO3	2	1	3	1	2		1		2	1	2	3	1	2
CO4	1		2	2	3	1	2	2	1		2	2	1	1
CO5	2	3	1	2	2	1		2	1	3	2	1	2	1

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K.S.Rangasamy College of Technology – Autonomous								R2018
50 CE E43 Advanced Construction Management								
B.E.Civil Engineering								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VII	2	0	2	45	3	50	50	100

Objective(s)	• To study the finer aspects of planning, scheduling and controlling of construction projects. • To understand the time cost relationship using different methods, • To bring about an exposure to Advanced construction management applied to construction industry. • To Introduce the elements of human behavior and their impact on construction personnel management. • To evaluate construction activity , life cycle costing and value analysis.
Course Outcomes	**At the end of this course the students will be able to** CO1: To study the elements of construction planning , scheduling and techniques like networks and coding systems CO2: To apply the concepts of inventory, scheduling and other related problems CO3: To study the concept of gathering and using project information CO4: To apply the studied behavior pattern to manpower planning in organizational setups. CO5: To study the relationship between quality and safety management

Construction Management Schedules

Relevance of Construction Schedules - The Critical Path Method - Calculations for Critical Path Scheduling -Activity Float and Schedules -Presenting Project Schedules Critical Path Scheduling for Activity-on-Node and with Leads, Lags and Windows - - Resource Oriented Scheduling - Scheduling with Resource Constraints and Precedence - Use of Advanced Scheduling Techniques - Scheduling with Uncertain Duration -Calculations for Monte Carlo Schedule Simulation – Scheduling In Poorly Structured Problems - Improving the Scheduling Process. [09]

Time-Cost Relationship of Operations Research Management

Introduction to Operations research-Linear Programming-Graphical and Simplex Methods- Duality and Post-Optimality Analysis- Dynamic programming- Capital Budgeting problem, Reliability improvement problem, Shortest path method. [09]

Project Information

Types of Project Information - Accuracy and Use of Information -Computerized Organization and Use of Information -Organizing Information in Databases - Relational Mode of Databases - Other Conceptual Models of Databases - Centralized - Database Management Systems - Databases and Applications Programs – Information - Transfer and Flow. [09]

Performance Appraisal

Compensation- Wages and Salary, Employee Benefits, employee appraisal and assessment- Employee services - Safety and Health -Discipline and discharge - Special Human resource problems, Performance appraisal-Employee hand book and personnel manual -Job descriptions and organization structure and human relation - Productivity of Human resources. [09]

Construction Activity

Construction activity, environmental safety. Social and environmental factors- Natural causes and speed of Construction -Life cycle costing- Reliability and Probabilistic Methods-Value engineering and value analysis - Application of BIM. [09]

Total Hours: = 45 hours

Text book(s):

1	Seetharaman.S , “Construction engineering and management”, Dhanpat Rai Publications, Pune 2005.
2	Chitkara.K.K, “construction project management – Planning, Scheduling and control”, Tata McGraw Hill Publishing Co., New Delhi, 2005

Reference(s):

1	Vohra, N.D. “Quantitative Techniques in Management ", Tata McGraw Hill Co., Ltd, New Delhi, 2000
2	Seehroeder, R.G., “Operations Management ", McGraw Hill, USA, 2002.
3	Chitkara. K.K. “Construction Project Management: Planning Scheduling and Control”, Tata McGraw Hill Publishing Company, New Delhi, 2008
4	Sharma J C., “Construction Management and Accounts “, Sathyaprakasam, NewDelhi, 2006.

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COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	2	2	1	2	3	1	1	2	2	3	3		2	3
CO2	2	2	1	2	3	1	1	2	3	2	2	1	3	3
CO3	2	2	1	3	3		1	2	3	1	3	1	2	2
CO4	2	2	1	2	3	1	1	2	3	2	2		2	2
CO5	2	1	3	1	2	3	3	1	2	1	3	1	2	3

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K.S.Rangasamy College of Technology – Autonomous								R2018
51 CE E44 ADVANCED ENVIRONMENTAL ENGINEERING								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VII	2	0	2	45	3	50	50	100

Objective(s)	• To acquire knowledge on the concepts of various physico-chemical and biological treatment units with operation and maintenance aspects. • To study the methods of transporting water and wastewater along with distribution schemes.
Course Outcomes	**At the end of this course the students will be able to** CO1: Point out the physico-chemical treatment systems and their kinetics and Outline the biological treatment systems with their kinetics CO2: Describe the principles of municipal and industrial physico-chemical treatment units, membrane processes and advanced techniques. CO3: Express the principles of aerobic and anaerobic biological treatment of wastewater. CO4: Point out the transmission operations of water and Design the distribution system with loss minimization and leak detection techniques. CO5: Illustrate the operations and planning of treatment plants.

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

POLLUTANTS IN WASTEWATER **[9]**

Pollutants in water and wastewater–characteristics, Standards for performance-Significance of physico-chemical treatment–Selection criteria-types of reactor-reactor selection-batch-continuous type-kinetics - Objectives of biological treatment – significance – kinetics of biological growth – Factors affecting growth – attached and suspended growth.

TRANSMISSION AND DISTRIBUTION **[9]**

Need for Transport of water and wastewater-Planning of Water System –Selection of pipe materials, Water transmission main design- gravity and pumping main; Selection of Pumps- characteristics- economics; Specials, Jointing, laying and maintenance, water hammer analysis; water distribution pipe networks Design, analysis and optimization – appurtenances – corrosion prevention – minimization of water losses – leak detection - Storage reservoirs.

PHYSICO-CHEMICAL TREATMENT **[9]**

Treatment plant layouts – selection of process - equalization - neutralization - chemical feeding devices - oil skimmer - tube settlers, duel media filters – softeners – demineralisers – evaporation – adsorption – isotherms – Membrane separation - Reverse Osmosis, nano filtration, ultra filtration and hyper filtration - electro dialysis, distillation– stripping and crystallization - solidification and stabilization - advanced oxidation/reduction.

BIOLOGICAL TREATMENT **[9]**

Design of sewage treatment plant units – aerobic treatment - sequencing batch reactors, membrane biological reactors - bio tower- RBC - moving bed reactors - fluidized bed reactors - aerated lagoons - constructed wet land – anaerobic treatment - attached and suspended growth process – UASB - up flow filters - Fluidized beds – MBR - septic tank and disposal – Nutrient removal systems – Natural coagulants.

OPERATIONS AND MAINTENANCE **[9]**

Construction and operational maintenance problems – trouble shooting – planning, organizing and controlling of plant operations – capacity building - retrofitting case studies – sewage treatment plants – sludge management facilities – Environmental policies and regulations. Online Monitoring – IOT applications in Environmental Engineering

Total Hours:45 hours

Text book (s):

1	Qasim,S.R., Motley, E.M and Zhu.G. "Water works Engineering – Planning, Design and Operation", Prentice Hall, New Delhi, 2008.
2	Metcalf and Eddy, "Wastewater Engineering, Treatment and Reuse" ,Tata McGraw Hill, New Delhi, 2008.

Reference (s) :

1	F.R. Spellman, "Hand Book of Water and Wastewater Treatment Plant operations", CRC Press, New York, 2009.
2	“Manual on water supply and Treatment”, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1999.
3	“Manual on Sewerage and Sewage Treatment”, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1999.

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CO1		1	3	1	3	1	1	3		1	2	1	1	2
CO2	3	2			2	2			2	2	3		2	1
CO3		2		2			1	2				3	3	
CO4	3		3	1	2	2	3		2	3	2	1		2
CO5	1	3		1		1	2	2	1	2	1	2	3	1

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K.S.Rangasamy College of Technology – Autonomous								R2018
50 CEE 45 Housing Planning and Management								
B.E. Civil Engineering								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VII	2	0	2	45	3	50	50	100

Objective(s)	• To reproduce the basic concept of buildings. • To relate the Housing standards and programmes. • To learn the design of housing projects • To impart the knowledge on modern materials and methods. • To acquire more knowledge on project appraisal
Course Outcomes	**At the end of this course the students will be able to** **CO1** Define the basic concepts on housing. CO2 Explain the basic concept and standards for housing programmes. CO3 Recognize the building byelaws and rules, development control regulations. CO4 Identify the different types of modern materials and methods of construction. CO5 Evaluation of housing projects for sustainable principles.

Note: The hours given against each topic are of indicative. The faculties have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

Introduction to Housing **[9]**

Definition of Basic Terms – House, Home, Household, Apartments, Multi storied Buildings, Special Buildings, Objectives and Strategies of National Housing Policies including Slum Housing Policy, Principle of Sustainable Housing – Integrated approach on arriving holding capacity and density norms - All basic infrastructure consideration - Institutions for Housing at National, State and Local levels.

Housing Programmes **[9]**

Basic Concepts, Contents and Standards for Housing Programmes - Sites and Services, Neighborhoods-Plotted land development programs, Open Development Plots, Apartments, Gated communities, Townships, Rental Housing, Co-operative Housing, Slum Housing Programmes – Slum improvement – Slum redevelopment and Relocation – Use of GIS and MIS in Slum Housing Projects,, Role of Public housing agencies, and Private sector in supply , quality, infrastructure and pricing – Role of Non-Government Organizations in slum housing.

Planning and Design of Housing Projects **[9]**

Formulation of Housing Projects – Land Use and Soil suitability analysis -Building Byelaws and Rules and Development Control Regulations - Site Analysis, Layout Design, Design of Housing Units (Design Problems) – Housing Project Formulation.

Construction Techniques and Cost-Effective Materials **[9]**

New Constructions Techniques – Cost Effective Modern Materials and methods of Construction- Green building concept- Building Centers – Concept, Functions and Performance Evaluation.

Housing Finance and Project Appraisal **[9]**

Evaluation of Housing Projects for sustainable principles – Housing Finance, Cost Recovery – Cash Flow Analysis, Subsidy and Cross Subsidy- Public Private Partnership Projects – Viability Gap Funding - Pricing of Housing Units (Problems).

Total Hours = 45 hours

Text book(s):

1	Meera Mehta and Dinesh Mehta, "Metropolitan Housing Markets", Sage Publications Pvt. Ltd., ND, 2015.
2	Francis Cherunilam and Odeyar D Heggade, "Housing in India", Himalaya Publishing House, Bombay, 2017.

Reference(s):

1	Wiley- Blackwell, "Neufert Architects" Data, 4 th Edition, Blackwell Publishing Ltd, 2014
2	Donald Watson and Michael J.Crosbie, "Time Saver Standards for Architectural Design", 8 th Edition, Tata McGraw Hill Edition, 2018
3	Chandrasekar. K.and Karthikeyan.N.,"Housing planning and Management". CGS Publishers & Distributors, 2015
4	uLektz, "Housing and planning and management" uLektz learning solutions, 2015

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CO1	1			2				3					2	
CO2		2			3		**1**							2
CO3	1		2			1				3			2	
CO4		1		3			2					3		3
CO5	1		1					2			3		3	

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K.S.Rangasamy College of Technology – Autonomous								R2018
50 CE E51 Project Management								
B.E. - Civil Engineering								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VIII	3	0	0	45	3	50	50	100

Objective(s)	• To assess about types of construction and various process in construction. • To study the various management techniques for successful completion of construction projects. • To study the innovative construction methods adopted in field. • To gain knowledge on the management process of material and equipment utilization. • To gain knowledge in cost estimation.
Course Outcomes	**At the end of this course the students will be able to** CO1: Study the modern tools for project management. CO2: Gain knowledge about various trends for strategic planning and owner builder relationship. CO3: Study on design and construction process of civil engineering project and its importance. CO4: Identify the optimized tool for labour, material and equipment utilization. CO5: Describe the requirements of cost estimation and quantity calculation.

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

THE OWNERS' PERSPECTIVE **[09]**

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.

ORGANIZING FOR PROJECT MANAGEMENT **[09]**

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.

DESIGN AND CONSTRUCTION PROCESS **[09]**

Design and Construction as an Integrated System - Innovation and Technological Feasibility - Innovation and Economic Feasibility - Design Methodology - Functional Design - Construction Site Environment.

LABOUR, MATERIAL AND EQUIPMENT UTILIZATION **[09]**

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.

COST ESTIMATION **[09]**

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.

Total Hours = 45 hours

Text book(s):

1	Chitkara, K.K. "Construction Project Management: Planning, Scheduling and Control", Tata McGraw-Hill Publishing Company, New Delhi, 2008.
2	Choudhury S , "Project Management", McGraw-Hill Publishing Company, New Delhi, 2008.

Reference(s):

1	Frederick E. Gould, "Construction Project Management", Wentworth Institute of Technology, Vary E. Joyce, Massachusetts Institute of Technology, 2000.
2	George J.Ritz , "Total Construction Project Management" - McGraw-Hill Inc, 2000.
3	Chris Hendrickson and Tung Au, "Project Management for Construction – Fundamental Concepts for Owners, Engineers, Architects and Builders", Prentice Hall, Pittsburgh, 2015.
4	S. Keoki Sears, Glenn A. Sears and Richard H. Clough, “Construction Project Management: A Practical Guide

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	to Field Construction Management", John Wiley & Sons, 2015.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		1	3	1	3		1	3		1		1		2
CO2	3					2			2		3		2	1
CO3		2		2			1	2				3	3	
CO4	3		3	1	2	2	3		2	3				2
CO5	1	3		1			2	2	1		1	2	3	1

K.S.Rangasamy College of Technology – Autonomous								R2018
50 CE E52- Safety in Construction								
B.E.Civil Engineering								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VIII	3	0	0	45	3	50	50	100

Objective(s)	• Analyze how building and fire codes interact with building construction and fire protection. • Describe the causes of the most common workplace injuries. • To learn about safety related challenges in construction industry. • To study the various types of construction accident. • To study the fire control technology in construction industry.
Course Outcomes	**At the end of this course the students will be able to** CO1: Analyze the concept of safety management CO2: Describe the various hazardous of construction sector CO3: Explain the various types of building with their prevention of hazardous of construction CO4: Discuss with different fire situations and firefighting using extinguishers. CO5: Describe the safe construction, specification and cost of safety

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

Introduction to Health, Safety and Environment **[9]**

Introduction to Safety Management - Need for Safety in Indian Construction Sites - Industrial Safety - Health Management - Environment Management - Health and Safety Commission - IS Safety Codes - General Requirements & Legislation for Protective Clothing and Safety Equipment - Fire Fighting Arrangement

Hazards of Construction and their Prevention **[9]**

Introduction - Physical Injury Hazards – Chemical Hazards - Physical Hazards - Biological Hazards - Excavation – Scaffolding –Structural Framework and Roof work - Cranes and Heavy Lifting - Transport and Mobile Plants – Highways - Sewers and Confined Spaces.

Accidents and First Aid **[9]**

Types of Accidents in construction industry - Site Arrangements for Health, Safety and Welfare - First-aid Facilities - Reporting Injuries - Accident Investigation.

Fire Control Technology **[9]**

Hose - Types of hose – Characteristic - Types of hose fittings –Ladders- Introduction - Hook ladder - escape ladder - turn table - extension ladder - Hook ladder belts - Water relay system - Open circuit system - Closed circuit system – Pumps - Testing of pumps – Types of Pumps.

Management Systems for Safe Construction & Safety Costs **[9]**

Pre-contract Activities - Survey and Investigation- Design and Specification, Design Aids for Safe Construction - Management of Construction - Costs of Safety

Total Hours:45 hours

Text book(s):

1	D S SGanguly& C S Changeriya – Safety Management, ChetanPrakashan publishes , 1998
2	Steve Rowlinson - Construction Safety Management Systems – New Delhi – 2004.

Reference(s):

1	Levitt, R.E. and Samelson, N.M., “Construction Safety Management”, Mc. Graw Hill Book Company, Inc., N.Y. 1991.
2	R.K. Mishra – “Construction Safety” – AITBS Publishers, India, 2013.
3	Jimmy W.Hinze, “Construction Safety ", Prentice Hall Inc., 1997.
4	Richard J. Coble, Jimmie Hinze and Theo C. Haupt, “Construction Safety and Health Management ", Prentice Hall Inc., 2001

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CO1	1		1	2	1		2	2	1		3	1	3	2
CO2	2	1	1	1	1		3	1	1			1	1	1
CO3	2	1	1	2	2			1	2	1		3	2	1
CO4	2			1	2	1	1	1	1		1	3	1	1
CO5	2		1	1	2	1	1	1	1			1	3	1

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K.S.Rangasamy College of Technology – Autonomous								R2018
50 CE E53 - Corrosion Engineering								
B.E.Civil Engineering								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VIII	3	0	0	45	3	50	50	100

Objective(s)	• To provide an understanding of the corrosion principles. • To provide a knowledge about limitations of corrosion • To provide engineering methods used to minimize the corrosion. • To provide engineering methods used to prevent the corrosion • To provide an understanding of Construction Materials and Practices ding of corrosion Inhibition
Course Outcomes	**At the end of this course the students will be able to** CO1: Study about the importance of corrosion CO2: Summarize about the different types of corrosion CO3: Select technique for corrosion prevention. CO4: Demonstrate the defects of corrosion CO5: Recall the different types of corrosion Inhibiters

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

Importance of corrosion prevention in various industries

The direct and indirect effects of corrosion – The free energy and oxidation potential criterion of uniform corrosion – the pilling Bed work ratio and it consequences – the units corrosion rate – mdd and mpy – The importance of pitting factor – Pourbaix digrams of Mg, Al. and Fe – Their and limitations . **[09]**

Localized corrosion

The electro chemical mechanism Vs. The chemical mechanism – Galvanic corrosion – Area effect in anodic and cathodic metal coatings, Organic coatings of bimetallic systems – prediction using emf Series and Galvanic series – Crevice corrosion – Mechanism of differential oxygenation corrosion – Auto catalytic mechanism of pitting due to crevice or differential oxygenation corrosion – Principles and procedures of cathodic protection: Sacrificial anodes and external cathodic current impression – stray current corrosion. **[09]**

Intergranular corrosion

Stainless steels – cause and mechanism (Cr- Depletion theory) – Weld decay and knife line attack – Stress corrosion and fatigue corrosion – Theory of critical corrosion rate in corrosion fatigue. Cavitation damage – Fretting damage – Atmospheric corrosion – Bacterial corrosion – Marine corrosion – Control methods. High temperature Oxidation of metals – Ionic diffusion through protective oxides – Classification on the basis of kinetics or rates of oxidation. . **[09]**

Kinetic aspects of corrosion

Over potential activation and concentration over potentials – Exchange current density – Mixed potential theory – corrosion rates of Fe. And Zn. In air – free acid – effect of oxidizing agents – Phenomenon of passivation – Theories – effect of oxidizing agents and velocity of flow on passivating metals – effect of galvanic coupling of Fe. and Ti respectively with Platinum – Noble metal alloying – anodic protection. . **[09]**

Corrosion in inhibition

Inhibiters of corrosion – passivators, adsorbing inhibiters, V.P. inhibiters. Prevention of galvanic crevice, inter granular, Stress and fatigue corrosion at the design stage and in service conditions – control of catastrophic oxidation and Hydrogen disease - control of Bacterial corrosion – Langelier saturation Index and its uses. Corrosion prevention by Coatings – Surface pre- treatment – Hot dip, diffusion and cladded coatings – Phosphating and its uses. . **[09]**

Total Hours: 45

Text book(s):

1	Fontana, M.G., “Corrosion Engineering”, Tata McGraw-Hill, 2008. 3rd ed. (seventh reprint)
2	Jones, D.A., “Principles and Prevention of Corrosion”, Prentice-Hall, 1996.

Reference(s):

1	Pierre R. Roberge, “Corrosion engineering: principles and practice”, McGraw-Hill,2008.
2	Pierre R. Roberge, “Handbook of corrosion engineering”, McGraw-Hill,2012.
3	Sastri, V.S., Ghali, E. and Elboujdaini, M., “Corrosion prevention and protection”,Practical solutions, John

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	Wiley and Sons, 2007.
4	Branko N.Popov., '' Corrosion Engineering: Principles and Solved Problems'', Elsevier, 2015.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	2	2	2	3	2	3	1	2	3	2	1	3	2	3
CO2	2	2	3	3	2	3	3	2	2	3	1		2	3
CO3	3	2	2	2	2	2	3	2	1		1	1	3	2
CO4	2	3	2	3	3	3	2	3	2	3	1		3	3
CO5	3	2	2	3	2	1	3	2	3	1	3	1	2	3

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K.S.Rangasamy College of Technology – Autonomous								R2018
50 CE E54 - Experimental Stress Analysis								
B.E. Civil Engineering								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VIII	3	0	0	45	3	50	50	100

Objective(s)	• To learn the basics in measurements, strain gauge types, and applications • To understand various data recording instruments • To acquire knowledge in vibration measurement systems • To learn different non destructive testing methods • To gain knowledge on photo elasticity and stress separation methods
Course Outcomes	**At the end of this course the students will be able to** CO1: Learn the principles of force and strain measurements CO2: Identify suitable data recording instruments CO3 :Express the principle of vibration instruments CO4: Apply non-destructive techniques in evaluating the structures CO5 :Perform model analysis for large scale structures.

Note: The hours given against each topic are of indicative. The faculty has the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

Force and Strain Measurements **(8)**

Principles of measurements, Accuracy, Sensitivity and range of measurements.Mechanical, Optical, Acoustical and Electrical extensometers and their uses, Advantages
and disadvantages.

Data Recording **(10)**

Strain gauge circuits – Potentiometer and Wheatstone bridge – use of lead wires switches etc., - Use of electrical resistance strain gauges in transducer applications – LVDT - Indicating and recording devices - Static and dynamic data recording – Data (Digital and Analogue) acquisition and processing systems.

Vibration Measurement **(10)**

Strain analysis methods – Rosette analysis. Static and dynamic testing techniques. - Equipment for loading - Moire's techniques - Transducers for velocity and acceleration measurements - vibration meter - Seismographs - vibration analyzer - Cathode Ray Oscilloscope.

Non-Destructive Testing Techniques **(8)**

Non-destructive testing techniques - Load testing of structures, Buildings, bridges and towers -Acoustic emission - holography - use of laser for structural testing - Laser and Image processing Techniques -Heat thermo coupler and heat measurements.

Model Analysis **(9)**

Laws of similitude - model materials – model testing – testing large scale structures – holographic techniques – Photoelasticity – optics of photoelasticity – Polariscope – Isoclinics and Isochromatics - methods of stress separation – wind tunnel and its use in structural analysis.

Total Hours:45 hours

Text book(s):

1	Sadhu Singh, "Experimental Stress Analysis", Khanna Publishers, New Delhi,1996
2	Dally J W and Riley W.F, "Experimental stress Analysis", McGraw-Hill, Inc. NewYork, 1991

Reference(s):

1	Rangan C S., "Instrumentation – Devices and Systems", Tata McGraw-Hill Publishing Co., Ltd., New Delhi, 1997
2	Sirohi. R.S.,Radhakrishna.H.C, "Mechanical Measurements", New Age International (P) Ltd. 1997
3	Charles J Hellier, Handbook of Non destructive Evaluation, Second Edition, Mc graw Hill Education,2012
4	Ravisankar.K. and Chellappan.A., "Advanced course on Non-Destructive Testing and Evaluation of Concrete Structures" SERC, Chennai, 2007.

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Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	3	3	1	1		1	3	2	1	3	2
CO2	3	2	1	2	3	1	1	1	1	3	2	1	3	2
CO3	3	1	3	3	2	1			1	2	2		3	1
CO4	3	3	3	3	3	3	1	1	2	2	2	2	3	3
CO5	3	3	3	3	3	3	1	1	2	3	3	1	3	3

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K.S.Rangasamy College of Technology – Autonomous								R2018
50 CE E55 Industrial Waste Management								
B.E. Civil Engineering								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VIII	3	0	0	45	3	50	50	100

Objective(s)	• To examine the characteristics of industrial wastes • To acquire knowledge on waste minimization & management approach. • To learn the pollution from major industries and methods of controlling the same • To select the various treatment Technologies. • To analyze the hazardous wastes and impacts
Course Outcomes	**At the end of this course the students will be able to** CO1 Classify the industrial pollution CO2 Apply knowledge to waste minimization and waste management system. CO3 Identify the various sources and characteristics major industries CO4 Illustrate the various treatment technologies adopted for industrial pollution. CO5 Analyze the hazardous wastes impacts

Note: The hours given against each topic are of indicative. The faculties have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

Introduction **[9]**

Types of industries and industrial pollution – Characteristics of industrial wastes – Population equivalent – Bioassay studies – effects of industrial effluents on streams, sewer, land, sewage treatment plants and human health – Environmental legislations related to prevention and control of industrial effluents and hazardous wastes.

Waste Minimisation and Management **[9]**

Waste management approach – Waste audit – Volume and strength reduction – Material and process modifications – Recycle, reuse and byproduct recovery – Applications – Case studies.

Pollution from Major Industries **[9]**

Sources, characteristics, waste treatment flow sheets for selected industries such as Textiles, Tanneries, Dairy, Sugar, Paper, distilleries, Fertilizer, Pharmaceuticals, Electroplating industries, Steel plants, Refineries, Thermal power plants – Cleaner production options – Wastewater reclamation concepts.

Treatment Technologies **[9]**

Equalisation – Neutralisation – Removal of suspended and dissolved organic solids – Chemical oxidation – Adsorption - Removal of dissolved inorganics – Combined treatment of industrial and municipal wastes – Residue management – Dewatering – Disposal.

Hazardous Waste Management **[9]**

Hazardous wastes – impacts – Physico chemical treatment – Solidification – Incineration – Secured landfills – Leachate collection and treatment – case studies of hazardous waste management in Indian cities.

Total Hours : 45 hours

Text book(s):

1	Rao M.N., & A.K.Dutta., "Wastewater Treatment", Oxford - IBH Publication, 2008
2	Eckenfelder, W.W., "Industrial Water Pollution Control", McGraw-Hill Higher Education, 2009.

Reference(s):

1	H.M.Freeman., "Industrial Pollution Prevention Hand Book", McGraw-Hill Inc., New Delhi, 2005.
2	Stephenson R.L., and Blackburn, J.B., "Industrial Wastewater Systems Hand Book", Lewis Publisher, New York, 2002.
3.	H.S. Bhatia, " Industrial waste and its management", Misha Books; First edition , 2019
4.	Vimalkumar. " Industrial processes and waste stream management", Scitus publications, 2016

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		1			2			3						3
CO2	1					2				3				3
CO3			1	2			3				2		2	
CO4	1					2			1			3	1	
CO5		1	3			3					2			2

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K.S.Rangasamy College of Technology – Autonomous R2018								
50 GE 001 – National Cadet Corps (Air Wing)								
Semester	Hours / Week			Total Hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
IV	3	0	2	45	3	50	50	100

Objective(s)	• Develop character , camaraderie, • Inculcate discipline, secular outlook • Enrich the spirit of adventure, sportsman spirit • Ideals of selfless service amongst cadets by working in teams • Improve qualities such as self-discipline, self-confidence, self-reliance and dignity of labour in the cadets.
Course Outcomes	**At the end of the course, the students will be able to** CO1: Display sense of patriotism, secular values and shall be transformed into motivated youth who will carry out nation building through national unity and social cohesion. CO2: Demonstrate the sense of discipline with smartness and have basic knowledge of weapons and their use and handling CO3: Illustrate various forces and moments acting on aircraft CO4: Outline the concepts of aircraft engine and rocket propulsion CO5: Design, build and fly chuck gliders/model airplanes and display static models

Note: Hours notified against each unit in the syllabus are only indicative but are not decisive. Faculty may decide the number of hours for each unit depending upon the concepts and depth. Questions need not be asked based on the number of hours notified against each unit in the syllabus**.**

NCC Organization & National Integration **[9]**

NCC Organization – History of NCC- NCC Organization- NCC Training- NCC Uniform – Promotion of NCC cadets – Aim and advantages of NCC Training- NCC badges of Rank- Honors' and Awards – Incentives for NCC cadets by central and state govt. History and Organization of IAF-Indo-Pak War-1971-Operation Safed Sagar. National Integration- Unity in diversity- contribution of youth in nation building- national integration council- Images and Slogans on National Integration.

Drill&WeaponTraining **[9]**

Drill- Words of commands- position and commands- sizing and forming- saluting- marching- turning on the march and wheeling- saluting on the march- side pace, pace forward and to the rear- marking time- Drill with arms- ceremonial drill- guard mounting.(WITH DEMONSTRATION). Main Parts of a Rifle- Characteristics of .22 rifle- loading and unloading – position and holding- safety precautions – range procedure- MPI and Elevation- Group and Snap shooting- Long/Short range firing (WITH PRACTICE SESSION)

Principles of Flight **[9]**

Laws of motion-Forces acting on aircraft–Bernoulli's theorem-Stalling-Primary control surfaces – secondary control surfaces-Aircraft recognition.

Aero Engines **[9]**

Introduction of Aero engine-Types of engine-piston engine-jet engines-Turboprop engines-Basic Flight Instruments-Modern trends.

Aero Modeling **[9]**

History of aero modeling-Materials used in Aero-modeling-Types of Aero-models – Static Models-Gliders-Control line models-Radio Control Models-Building and Flying of Aero-models.

Total Hours: 45

Text Book(s):

1.	"National Cadet Corps- A Concise handbook of NCC Cadets" by Ramesh Publishing House, New Delhi,2014.
2.	***"NCC OTA Precise" by DGNCC, New Delhi,2014***

Reference(s)

1.	"Cadets Handbook – Common Subjects SD/SW" by DG NCC, New Delhi,2019
2.	"Cadets Handbook – Specialised Subjects SD/SW" by DG NCC, New Delhi,2017

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COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1						3	3	3	3	3		3
CO2					3						3	2
CO3	3	2	1	1								
CO4	3	2	1	1								
CO5	3	2	1	1								

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K.S.Rangasamy College of Technology – Autonomous R2018

50 GE 002 – National Cadet Corps (Army Wing)

Semester	Hours / Week			Total Hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
IV	3	0	2	60	3	50	50	100

Objective(s)	• Develop character , camaraderie, • Inculcate discipline, secular outlook • Enrich the spirit of adventure, sportsman spirit • Ideals of selfless service amongst cadets by working in teams • Improve qualities such as self-discipline, self-confidence, self-reliance and dignity of labour in the cadets.
Course Outcomes	**At the end of the course, the students will be able to** CO1: Display sense of patriotism, secular values and shall be transformed into motivated youth who will carry out nation building through national unity and social cohesion. CO2: Demonstrate Health Exercises, the sense of discipline, improve bearing, smartness, turnout, develop the quality of immediate and implicit obedience of orders. CO3: Basic knowledge of weapons and their use and handling. CO4: Aware about social evils and shall inculcate sense of whistle blowing against such evils and ways to eradicate such evils CO5: Acquaint, expose & provide knowledge about Army/Navy/ Air force and to acquire information about expansion of Armed Forces, service subjects and important battles

Note: Hours notified against each unit in the syllabus are only indicative but are not decisive. Faculty may decide the number of hours for each unit depending upon the concepts and depth. Questions need not be asked based on the number of hours notified against each unit in the syllabus**.**

NCC Organization & National Integration **[9]**

NCC Organization – History of NCC- NCC Organization- NCC Training- NCC Uniform – Promotion of NCC cadets – Aim and advantages of NCC Training- NCC badges of Rank- Honors' and Awards – Incentives for NCC cadets by central and state govt.

National Integration - Unity in diversity- contribution of youth in nation building- national integration council- Images and Slogans on National Integration.

Basic Physical Training & Drill **[9]**

Basic physical Training – various exercises for fitness(with Demonstration)-Food – Hygiene and Cleaniness .Drill- Words of commands- position and commands- sizing and forming- saluting- marching- turning on the march and wheeling- saluting on the march- side pace, pace forward and to the rear- marking time- Drill with arms- ceremonial drill- guard mounting.(WITH DEMONSTRATION)

Weapon Training **[9]**

Main Parts of a Rifle- Characteristics of .303 rifle- Characteristics of .22 rifle- loading and unloading – position and holding- safety precautions – range procedure- MPI and Elevation- Group and Snap shooting- Long/Short range firing(WITH PRACTICE SESSION) - Characteristics of 5.56mm rifle- Characteristics of 7.62mm SLR- LMG- carbine machine gun – pistol.

Social Awareness and Community Development **[9]**

Aims of Social service-Various Means and ways of social services- family planning – HIV and AIDS- Cancer its causes and preventive measures- NGO and their activities- Drug trafficking- Rural development programmes - MGNREGA-SGSY-JGSY-NSAP-PMGSY-Terrorism and counter terrorism- Corruption – female foeticide -dowry –child abuse-RTI Act- RTE Act-Protection of children from sexual offences act- civic sense and responsibility

Specialized Subject (ARMY) **[9]**

Basic structure of Armed Forces- Military History – War heroes- battles of Indo-Pak war- Param Vir Chakra- Career in the Defence forces- Service tests and interviews.

Total Hours: 45

Text Book(s):

1.	National Cadet Corps- A Concise handbook of NCC Cadets by Ramesh Publishing House, New Delhi, 2014
2.	***Cadets Handbook- Specialized Subjects SD/SW published by DG NCC, New Delhi ,2014***

Reference(s)

1.	"Cadets Handbook – Common Subjects SD/SW" by DG NCC, New Delhi,2019
2.	"Cadets Handbook – Specialised Subjects SD/SW" by DG NCC, New Delhi,2017

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COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1						1		3				
CO2								2				
CO3						1		3				
CO4								2				
CO5								3				

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K.S.Rangasamy College of Technology – Autonomous								R2018
50 CE L01 - Remote Sensing and GIS Applications								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
	3	0	0	45	3	50	50	100

Objective(s)	• To make them aware of basic concepts related to Remote Sensing Including data collection, aerial, satellite platforms and modern sensors. • To acquire knowledge on applications of Remote Sensing and GIS tool in Various level of electrical engineering like power transmission and distribution purpose through planning analyzing and managing the electrical system. • To gain knowledge on applications of Remote Sensing and GIS tool in Various level of electronics and Communication engineering in demand forecasting - Capital planning etc., • To realize that in effective water resource management system Geographical Information System (GIS) is used as best analyzing tool. • Emphasis about microwave-radar remote sensing applications in various civil engineering applications.
Course Outcomes	At the end of this course the students will be able to CO1: Explain the basics of Remote sensing CO2: Apply GIS in Electrical Engineering. CO3: Illustrate GIS applications in Electronics and Communication Engineering. CO4: Associate GIS applications in Water Resource Engineering. CO5: Demonstrate GIS applications in Civil Engineering.

Introduction **[09]**

Remote sensing - definition- Principles - Types – aerial –satellite- Remote Sensing process. EMR interaction with atmosphere - Earth surface features (soil, water and vegetation). Types- platforms - sensors- resolution, Air photos - imageries - false colour composite- map - scale - Fundamentals of stereoscopy-overlap-side lap – Elements of visual image interpretation.

Remote Sensing and GIS Applications in Electrical engineering **[09]**

Utilize GIS and GPS in Electrical Power System- Energy audit-Load management-Network planning and analysis- Determination of optimum, shortest and most economic path for transmission lines. Predict and forecast the future power demand – Locating the probable electrical disaster points in the grid both local and regional level.

Remote Sensing and GIS Applications in Electronics and Communication Engineering **[09]**

GIS – connection with Telecommunication Management Network (TMN) - Enhancement of Interoperability-integrates information for marketing - demand forecasting - Capital planning- engineering-Wire line and wireless, customer relationship management (CRM), operations support system (OSS), and fleet management.

Remote Sensing and GIS Applications in Water Resources **[09]**

Rainfall-runoff - Water quality - Thematic maps- 4M GIS approach water resources system Groundwater modeling - Flood inundation mapping and Modeling - Drought monitoring -Performance evaluation of irrigation commands. Site selection for artificial recharge - Reservoir sedimentation.

Remote Sensing and GIS Applications in Civil Engineering **[09]**

Identification – use of remote sensing data for landslides – LIDAR techniques and its contribution in terrain mapping. Radar remote sensing techniques – GPRT (Ground penetration radar techniques) usage of radar techniques – for repair and rehabilitation of age old civil engineering structures (Dams, tunnels and reservoirs).

Text book (s) :

1	Basudeb Bhatta, “Remote Sensing and GIS”, Oxford university press, New Delhi, Second Edition,2014.
2	Thomas Lillesand, W Ralph, Kiefer, Jonathan Chipman, “ Remote Sensing and Image Interpretation”, 7th Edition, Wiley,2015.

Reference (s) :

1	M D Steven and J A Cllark, “Application of Remote sensing in Agriculture”, Butterworths, London,1990.
2	Space Applications Centre. Manual for Forest mapping and Damage detection using satellite data, Report No. IRS-UP/SAC/FMDD/TN/16/90, pp-253, 1990.
3	Peter A.Burrough, A Rachael and McDonnell, “Principles of GIS”,Oxford University Press,2000.
4	R Michael Hord, “Remote Sensing methods and application”, John Wiley and Sons, New York,1986.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	1	2		2			3		1	2		2	1	2
CO2			2	3	1		2		2				1	2
CO3			1		2	1					2		1	2
CO4			2		2						1		1	2
CO5	1	2		2	2	2			2				1	2

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K.S.Rangasamy College of Technology – Autonomous								R2018
50 CE L02 - Disaster Management and Mitigation Measures								
B.E. Civil Engineering								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
	3	0	0	45	3	50	50	100

Objective(s)	• To provide basic conceptual understanding of disasters • To learn various types of disasters and their effects • To study the approaches in disaster management • To understand various mitigation measures • To apply GIS in disaster mitigation
Course Outcomes	**At the end of this course the students will be able to** CO1 :Express the key concepts, definitions of hazards and disasters CO2 :Identify natural and manmade disasters CO3: Describe the disaster management cycle CO4: Apply the knowledge of risk assessment and protect the public CO5 :Summarise the mitigation measures for various disasters

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

Introduction to Disaster **[08]**

Definition, Nature, Importance of Hazard, Risk, Vulnerability, Resilience and Disaster- Dimensions & Scope of Disaster Management - India's Key Hazards – Vulnerabilities - National disaster management framework - – Disaster management in India.

Natural and Anthropogenic Disaster **[09]**

Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks of Disease And Epidemics, War And Conflicts.

Approaches in Disaster Management **[11]**

Disaster Management Cycle -Pre- disaster stage (preparedness) - Preparing hazard zonation maps, Predictability/ forecasting & warning -Preparing disaster preparedness plan - Land use zoning - Preparedness through Information, education. Emergency Stage - Rescue training for search & operation - Immediate relief – Assessment surveys. Post Disaster stage – Rehabilitation - Social Aspect - Economic Aspect and Environmental Aspect

Disaster Mitigation **[09]**

Concept and Strategies of Disaster Mitigation , Disaster Risk- Elements, Disaster Risk Reduction, Techniques of Risk Assessment, Global Co-operation in Risk Assessment and Warning, People's Participation in Risk Assessment- Community based disaster risk reduction

Mitigation measures **[09]**

Emerging Trends in Mitigation, Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India, Role of remote sensing and GIS in disaster mitigation- Case study.

Total Hours: 45

Text books

1	Sarvothaman, H. And Anandha Kumar, KJ., "Disaster management: Engineering and Environmental Aspects", Asiatech Publishers Inc., New Delhi, 2013.
2	Nidhi Gauba Dhawan and Ambrina Sardar Khan, Disaster Management and Preparedness, CBS Publishers & Distributors, New Delhi, 2014.

References

1	Rajib Shaw and Krishnamurthy RR., "Disaster: Global Challenges and Local Solutions," Universities Press (I) Pvt. Ltd., Hyderabad, 2012.
2	Pardeep Sahni, Alka Dhameja, Uma Medury ,"Disaster Mitigation -Experiences And Reflections", PHI Learning Private limited, New Delhi, 2010
3	R.B. Singh ,"Natural Hazards and Disaster Management: Vulnerability and Mitigation", Rawat Publications, 2006
4	National Disaster Management Plan (NDMP), National Disaster Management Authority Government of India, 2016

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CO1	2	2	3		3	3	3		2	3	2	1	2	3
CO2	1	2	3		3	3	3		2	3	1	1	2	2
CO3	1	1	2		2	2	2		2	2	2	1	3	2
CO4	3	3	3	1	2	2	2	1	2	3	2	1	3	1
CO5	1	1	3	2	2	3	3		3	3	1	1	3	2

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K.S.Rangasamy College of Technology – Autonomous								R2018
50 CE L03 - Waste Management Techniques								
B.E. Civil Engineering								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
	3	0	0	45	3	50	50	100
Objective(s)	• To understand the types and sources of different types of wastes. • To study the generation, characteristics, composition and analysis of municipal solid waste, hazardous waste and biomedical waste. • To gain knowledge on the management concepts of wastes from different sources. • To understand the various sorting, material recovery and processing techniques. • To know different disposal and treatment methods for municipal solid waste, hazardous waste and biomedical waste.							
Course Outcomes	**At the end of this course the students will be able to** CO1: Understand various types, sources and legislations on wastes. CO2: Analyze the composition and characteristics of municipal and hazardous wastes. CO3: Summarize the management concepts of biomedical, E & Plastic wastes. CO4: Describe the processing and energy recovery from solid wastes. CO5: Explain the disposal methods, landfill components and their management.							

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

Introduction

Types and Sources: municipal solid wastes, hazardous wastes, biomedical wastes and E-wastes - Need for waste management - Legislations on management and handling of municipal solid wastes, hazardous wastes, and biomedical wastes, Elements of integrated waste management. **[09]**

Waste characterization and analysis

Waste generation rates – Composition - Methods of waste sampling – Characterization of solid wastes - Hazardous Characteristics – TCLP tests –- Source reduction of wastes – Recycling and reuse - Labeling and handling of hazardous wastes**.** **[09]**

Waste Management

Biomedical waste - Generation – identification – storage – collection – transport – treatment - common treatment and disposal - occupational hazards and safety measures - Biomedical waste legislation in India - E-waste management – Plastic waste management. **[09]**

Processing of waste

Sorting and material recovery: Objectives, Stages of sorting, Sorting operations, Guidelines for sorting for material recovery, Typical material recovery facility for a commingled solid waste. Processing techniques – biological and chemical conversion technologies, solidification and stabilization of hazardous wastes - Chemical Fixation & encapsulation - treatment of biomedical wastes. **[09]**

Disposal on landfill

Disposal in landfills - site selection - design and operation of sanitary landfills- secure landfills and landfill bioreactors – leachate and landfill gas management – landfill closure and environmental monitoring – landfill remediation. **[09]**

Total Hours: 45

Text book(s):

1	George Tchobanoglous and Frank Kreith, “Handbook of Solid Waste Management”, McGraw-Hill, New York, 2002.
2	M N Rao, Razia Sultana and Sri Harsha Kota, “Solid and Hazardous Waste Management”, Elsevier, 2016.

Reference(s):

1	Manual on Municipal Solid Waste Management, CPHEEO, Ministry of Housing and Urban affairs, Government of India, New Delhi, 2016.
2	Cheery PM, “Solid and Hazardous Waste Management”, CBS Publishers & Distributors, New Delhi, 2017.
3	Ramachandra T.V., “Management of Municipal Solid Waste”, TERI press, New Delhi, 2014.
4	A D Bhide and B B Sundaresan, “Solid Waste Management in Developing Countries”, Indian National Scientific Documentation Centre, 2010.

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CO1	3					2	3	2		1			2	1
CO2	3	2	1	3	2	2	2			1			3	2
CO3	3	2		1		2	3	2		1	1		2	2
CO4	3	1			1	2	2			1			2	2
CO5	3	2	2	1		3	3	1		1	1		2	2

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K.S.Rangasamy College of Technology - Autonomous								
50 CE L04- Climatic Changes and Adaptation Measures								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
	3	0	0	45	3	50	50	100

Objective(s)	• To make them aware of the fundamental factors caused for global warming • Provides clear picture of the atmosphere and its heat transfer through various atmospheric activities. • To create general awareness on climatic change impacts in various sectors and its influences in scaling the life standard of the influenced human society. • Importance and necessary of the role of international bodies like WMO, UNFCCC and IPCC in study of climatic changes and adaptation measures for the sustainable earth. • Strongly emphasis the necessary of innovative technologies to adopt at various levels of each stage in economic growth and development to minimize the overall emission rate.
Course Outcomes	At the end of this course the students will be able to 1. Describe the key concepts, definitions on key perspectives of all causes for global warming. 2. Summarize the mechanisms of Atmosphere and its components connected with global warming. Analyze the impact of global warming in climatic change in various fields like (Agriculture, Forestry, Ecosystem, Water Resources, Human Health Industry, Settlement and Society). 4. Explain various international conferences on carbon emission rate on different regions of world. 5. Identify various mitigation and Adaptive measurement planes for climatic change

EARTH'S CLIMATE SYSTEM **[09]**

Role of ozone in environment-ozone layer-ozone depleting gases-Green House Effect, Radiative Effects of Greenhouse Gases-The Hydrological Cycle-Green House Gases and Global Warming – Carbon Cycle.

ATMOSPHERE AND ITS COMPONENTS **[09]**

Importance of Atmosphere-Physical Chemical Characteristics of Atmosphere - Vertical structure of the atmosphere-Composition of the atmosphere-Atmospheric stability-Temperature profile of the atmosphere-Lapse rates- Temperature inversion-effects of inversion on pollution dispersion.

IMPACTS OF CLIMATE CHANGE **[09]**

Causes of Climate change : Change of Temperature in the environment-Melting of ice Pole-sea level rise-Impacts of Climate Change on various sectors – Agriculture, Forestry and Ecosystem – Water Resources – Human Health – Industry, Settlement and Society – Methods and Scenarios – Projected Impacts for Different Regions– Uncertainties in the Projected Impacts of limit Change – Risk of Irreversible Changes.

OBSERVED CHANGES AND ITS CAUSES **[09]**

Climate change and Carbon credits- CDM- Initiatives in India-Kyoto Protocol-Intergovernmental Panel on Climate change-Climate Sensitivity and Feedbacks – The Montreal Protocol – UNFCCC – IPCC –Evidences of Changes in Climate and Environment – on a Global Scale and in India.

CLIMATE CHANGE MITIGATION AND ADAPTATION MEASURES **[09]**

Difference between climate change mitigation and adaptation: Mitigation: Clean Development Mechanism –Carbon Trading- examples of future Clean Technology – Biodiesel – Natural Compost – Eco- Friendly Plastic – Alternate Energy – Hydrogen – Bio-fuels – Solar Energy – Wind – Hydroelectric Power – Mitigation Efforts in India. Adaptation measures include: using scarce water resources more efficiently; adapting building codes to future climate conditions and extreme weather events; building flood defenses and raising the levels of dykes; developing drought-tolerant crops; choosing tree species and forestry practices etc.

Total Hours: 45

Text book (s):

1	Dash Sushil Kumar, "Climate Change – An Indian Perspective", Cambridge University Press India Pvt. Ltd, 2007.
2	A report on "Adaptation and mitigation of climate change-Scientific Technical Analysis", Cambridge University Press, Cambridge, 2006.

Reference(s) :

1	J M Wallace and P V Hobbs "Atmospheric Science", Elsevier / Academic Press, 2006.
2	Jan C Van Dam, "Impacts of Climate Change and Climate Variability on Hydrological Regimes", Cambridge University Press, 2003.
3	Uitto et al, "Evaluating Climate Change Action for Sustainable Development", Open access Book, Springer link, 2017.
4	E Thomas, Dow, Kristin and Dowin, "The atlas of Climatic change :mapping the world's greatest challenge" University of California press, Berkeley, 2011.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	1		2		3		3		2	2	3	2	2	2
CO2	2		3		2	3				2		2	2	3
CO3			1		2	3				2		2	2	3
CO4		2			3		2					3	2	3
CO5			1		2		3		2			2	2	2

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K.S.Rangasamy College of Technology – Autonomous								R2018
50 CE L05 - Structural Health Monitoring								
B.E. Civil Engineering								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
	3	0	0	45	3	50	50	100
Objective(s)	• To understand the concept of structural health monitoring and assessment procedures • To learn various static and dynamic testing methods for structural health monitoring. • To acquire knowledge on various data acquisition systems • To apply IOT in structural health monitoring • To learn repair techniques in a structure							
Course Outcomes	**At the end of this course the students will be able to** CO1: Describe various Structural health monitoring procedures CO2 :Perform static & dynamic testing to assess a structure CO3 :Experiment the data acquisition system CO4 : Choose Software and Hardware required for remote health monitoring of structures CO5 : Identify repair techniques for rehabilitation of structures							

Note: The hours given against each topic are of indicative. The faculty has the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

Structural Health Monitoring **[09]**

Concepts, Factors affecting Health of Structures, Various Measures, Structural Safety in Alteration. Structural Audit: Assessment of Health of Structure, Collapse and Investigation, Investigation Management, SHM Procedures.

Testing **[10]**

Static Field Testing – Dynamic field testing - Stress history data - Dynamic load allowance tests - Ambient vibration tests - Forced Vibration Method - Dynamic response methods

Data Acquisition **[08]**

Static data acquisition systems - Dynamic data acquisition systems -Components of Data acquisition system - Hardware for Remote data acquisition systems.

Remote Structural health monitoring **[08]**

Remote Structural Health Monitoring - Importance and Advantages – Methodology – IoT applications in SHM – Application Machine leaning

Repair Techniques **[10]**

Repair techniques : Rust eliminators and polymer coating for steel bars during repairs - formed concrete, mortar and dry pack - Vacuum concrete - Gunite, shotcrete and Grouting - Epoxy injection - Mortar repair for cracks - shoring and under pinning.

Total Hours: 45

Text Books:

1	J.P. Ou, H.Li and Z.D. Duan," Structural Health Monitoring and Intelligent Infrastructure", Vol-1, Taylor and Francis Group, London, U.K, 2006.
2	Ravishankar.K., Krishnamoorthy.T.S, "Structural Health Monitoring, Repair and Rehabilitation of Concrete Structures", Allied Publishers, 2004.

Reference(s):

1	Douglas E Adams, "Health Monitoring of Structural Materials and Components - Methods with Applications", John Wiley and Sons, 2007.
2	Daniel Balageas, Claus-Peter Fritzen, Alfredo Güemes, "Structural Health Monitoring", Wiley , ISTE, 2006.
3	Victor Giurgiutiu, "Structural Health Monitoring", Academic Press, 2014
4	Handbook on Repair & Rehabilitation of R.C.C. Buildings, CPWD, Govt of India, 2011

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Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1			3	1	2		2	2	2	2	3	2
CO2	3	3	2	3	3	1	2		2	2	2	2	3	2
CO3	3	3	2	3	3	1	2		2	2	2	2	3	2
CO4	3		3	2	3	1	1	1	3	3	3	1	3	2
CO5	3	3	3	3	3	2	2	1	2	2	2	1	3	2

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K.S.Rangasamy College of Technology – Autonomous								R2018
50 CE L06 - Building Management System								
B.E. Civil Engineering								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
	3	0	0	45	3	50	50	100

Objective(s)	• To manage & control the sub-systems within a building to ensure a pleasant, controlled and safe environment. • To acquire knowledge about alarm systems. • To control some of the following building equipment's or operation like: HVAC, CCTV, Access Control, Fire and Intruder Alarms, Lighting and even Power Consumption. • To access Basic electronic components and getting familiarization on this. • To adopt heating and ventilation systems in buildings based on Provisions
Course Outcomes	**At the end of this course the students will be able to** CO1: Describe the History and Applications of Building Management Systems CO2: Learn about the electronic components and its functions CO3: Find the reduced operator training time through on-screen instructions CO4: Explain how computer technology is revolutionizing drafting, design, and engineering CO5: Optimize HVAC systems

Note: The hours given against each topic are of indicative. The faculty have the freedom to decide the hours required for each topic based on importance and depth of coverage required. The marks allotted for questions in the examinations shall not depend on the number of hours indicated.

Fundamentals of Building Management System **[09]**

Definition of BMS – Characteristics and Application - Components used in BMS - Basic design criteria for BMS - Concept of Green & Smart design - Energy management systems – Mechanical, Electrical and Plumping (MEP) Design fundamentals. **Basic electrical:** Power supply - Single phase and Three phase system - Types of load & calculation - Measurement of current, voltage & power - Different types of earthing.

Intruder Alarm **[09]**

Detector types & Selection – Requirements and Function of intruder alarm – Test methods - Panel types - Zone programming – Partitioning – Panel - Software interfacing. **Fire Alarm:** FDAS components - Smoke detection system – Classification – Fire detectors - Fire sprinkler system - Fire panel types - Zone & loop concepts - Class a & Class b wiring - Loop configuration - Map / pull station.

Basic Electronics **[09]**

Electronic components - Insulators, Metals and Semiconductors - switching time - concept of voltage gain, current gain and power gain - Circuit theory - Familiarization of tools - Selection of components - Lighting control - Multimeter, its Applications.

Computer Aided Design (CAD) **[09]**

Introduction to CAD - Elements of CAD - Essential requirements of CAD - Concepts of integrated CAD - Necessity & its importance - Engineering Applications - Design process of CAD- Sequential and Concurrent engineering - CAD system architecture - Line drawing - Clipping- Viewing transformation - 2D drafting - Modification tools - Object properties - layers – Dimensioning - Hatching – Blocks – Plot and layout.

Heating, Ventilation and Air Conditioning (HVAC) **[09]**

Purpose of HVAC – Air Handling Unit (AHU) - Ducting schematic layout – Chiller – Chiller plant operations – Water cooled chiller - Pumping systems - Ventilation system. **VFD - Variable-Frequency Drive:** Introduction - Basics of motors - MCC panel wiring - Programming of motor drives - Control panel wiring.

Total Hours: 45

Text book(s):

1. Stephan A. Roosa, Steve Doty and Wayne C. Turner, "Energy Management Handbook", Delhi, 2018.
2. Amlan Chakrabarti, "Energy Engineering And Management", PHI Learning India Pvt Ltd, 2014.

Reference(s):

1. Er. V.K. Jain, "Automation Systems in Smart and Green Buildings" (Modern Building Technology), Khanna Publisher, 2009.
2. Benny Raphael and Ian F. C. Smith, "Fundamentals of Computer–Aided Engineering", Delhi, 2003.
3. Albert Ting-Pat So, WaiLok Chan, "Intelligent Building Systems" Kluwer Academic publisher, 3rd ed., 2012.
4. W.T. Grondzik, & A.G. Kwok, Mechanical and Electrical Equipment for Buildings, Wiley, 2015

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CO1	1		1		1		2	1	1		3	1	3	2
CO2	3	1	2	2	2	1	1	1	2	1	1	1	1	1
CO3	1	1	1	2	2			1	2	1		3	1	1
CO4	2	1	1	1	3	1	1	1	1		1	3	3	2
CO5	2	1	1	3	2	1	1	1	1	1	2	1	2	1

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K.S.Rangasamy College of Technology – Autonomous								R2018
50 CE L07- Building Components								
B.E.Civil Engineering								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
	3	0	0	45	3	50	50	100
Objective(s)	• To have an understanding of the properties, characteristics, strength and application. • To study the principles of designing components of load bearing structures. • To understand the concept of naturally occurring building materials such as Stone, Bamboo, Lime and Mud. • To learn variousfoundation, plinth, wall, openings etc. with naturally occurring building materials. • To provide exposure on concepts of openings / fenestrations.							
Course Outcomes	**At the end of this course the students will be able to** 1. Discriminate the functions and response of materials. 2. Apply the concept of foundations suitable for construction materials. 3. Outline the applications of Walls. 4. Classify the different methods of Openings. 5. Analyse the applications of geo textiles, paints, varnishes, distempers and wood based Products.							

BUILDING MATERIALS

Selection of materials Eco building materials and construction. Low impact construction – bio mimicry, zero energy buildings, Nano technology and smart materials. **[09]**

FOUNDATIONS

Introduction to Building Components – Foundations – Foundations suitable for construction with buildings– Exercises on Foundations in History and Today's context. **[09]**

WALLS

Introduction to Building Components – Walls – Walls suitable for construction with buildings – Exercises on Walls in History and Today's context. **[09]**

OPENINGS / FENESTRATIONS

Introduction to Building Components – Openings – Openings/Fenestrations suitable for construction with buildings – Exercises on Openings / Fenestrations in History and Today's context. **[09]**

FINISHES

Introduction to Finishes – Paints, Plastering, Glazes and Varnishes – Exercises on different finishes in History and Today's context for building components with stone, bamboo, lime and mud – Market survey of Paints, Plastering materials, Glazes and Varnishes. **[09]**

Total Hours: 45

Text book(s):

1	Arora S.P. and Bindra S.P., "Text book of Building Construction", Dhanpat Rai & Sons, New Delhi, 2012.
2	Francis D.K. Ching, "Building Construction Illustrated" John Wiley & Sons ,2000.

Reference(s):

1	Ramamrutham S. "Basic Civil Engineering", Danpat Rai Publishing Company, 2002.
2	Dr.Punmia B.C., "Building Construction", Laxmi Publications Pvt. Ltd, New Delhi. 2002.
3	Barry, "The Construction of Buildings"; Affiliated East West press put Ltd New Delhi 2008.
4	G.C.Sahu, Joygopal Jena, "Building Materials and Construction"., McGraw Hill Education, 2017

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CO1	2	2	3	3	2	3	2	2	2	3	1	1	2	2
CO2	3	2	3	2	2	3	3	2	2	2			3	3
CO3	3	2	2	2	2	2	3	2	3		3	3	2	2
CO4	2	3	3	2	3	3	2	3	2	1	1		2	3
CO5	3	2	2	3	2	2	3	2	3	1	2	1	2	2

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