

## **Faculty of Engineering & Technology**

## **Department of Civil Engineering**



## **2-Year Full-Time Program**

## Master of Technology in Civil Engineering (Structural Engineering/ Transportation Engineering/ Remote Sensing and GIS)

With Effect from Year 2024



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### 1. NATURE AND EXTENT OF THE PROGRAM

A Master of Technology in Civil Engineering is a postgraduate program that focuses on advanced studies and research in various aspects of civil engineering. The program is designed to provide students with a deeper understanding of theoretical concepts, practical applications, and research methodologies in the field of civil engineering.

Master of Technology in Civil Engineering offers specializations in areas such as Structural Engineering, Geotechnical Engineering, Transportation Engineering, Environmental Engineering, Water Resources Engineering, and Construction Management.

The curriculum typically includes a mix of core courses, elective courses, and a research-based thesis or project. Core courses cover fundamental principles of civil engineering, while elective courses allow students to develop into specific areas of interest. The nature of Master of Technology in Civil Engineering is characterized by its focus on advanced education, research orientation, practical application, and a commitment to preparing graduates for successful careers in civil engineering. The program is designed to provide a well-rounded and in-depth understanding of the chosen specialization while fostering critical thinking and research skills.

A significant component of Master of Technology in Civil Engineering is the research work and the completion of a thesis. Students are required to identify a research topic, conduct a literature review, and undertake original research under the guidance of a faculty advisor. The thesis work provides an opportunity for students to contribute to the existing knowledge in their chosen specialization.

The Master of Technology in Civil Engineering program is typically delivered through a combination of classroom lectures, student's interactive sessions, industry expert lectures, seminars, hands-on workshops, live projects, laboratory sessions, Thesis writing and practical training.

Upon completion of the program, Graduates with an Master of Technology in Civil Engineering can pursue careers in various sectors, including construction and infrastructure development, consulting firms, research and development organizations, government agencies, and academia. Job roles may include structural engineer, geotechnical engineer, transportation planner, environmental consultant, and project manager.

In conclusion, Master of Technology in Civil Engineering provides students with the knowledge, skills, and research capabilities needed to excel in the field and contribute to advancements in civil engineering practices. The extent of Master of Technology in Civil Engineering program is



dynamic and ensure graduates are well-prepared for the challenges and opportunities in the field of civil engineering.

### 2. PROGRAM EDUCATION OBJECTIVES (PEOs)

After completing Master of Technology in Civil Engineering, students will be able to:

PEO No.	Education Objective
PEO1	Graduates of the program will have in-depth knowledge to identify and formulate challenging problems of Civil Engineering, apply appropriate research methodologies, use modern engineering tools and provide economical and sustainable solutions.
PEO2	To develop the design capability among students so that have the ability to innovate, develop and implement it in various interdisciplinary fields of civil engineering.
PEO3	To promote quality research and undertake research projects related to experimental investigation and use of software techniques, keeping in view the present and future needs of the civil industry.
PEO4	To develop the post-graduate civil engineers to undertake safe, economical and sustainable design of civil and other structures.
PEO5	To inculcate in the students the sense of ethics, morality, professionalism, creativity, leadership, independent thinking and self-confidence.



### **3. GRADUATE ATTRIBUTES**

Sl. No.	Attributes	Description
1	Pool of knowledge	Apply knowledge of civil engineering fundamentals and an engineering specialization to the solution of challenging civil engineering problems.
2	Critical thinking	Real-world experience through internships and practical training including Problem Identification, Analysis of Data, Risk Assessment and Analyze complex engineering problems contributes significantly to the development of critical thinking abilities in civil engineering professionals.
3	Problem solving	Conduct investigations of civil engineering complex problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.
4	Research skill	Develop the ability to search for, locate, extract, organize, evaluate and use or present information that is relevant to a particular topic.
5	Modern tool usage	Integration of modern tools in civil engineering enhances efficiency, accuracy, and collaboration throughout the entire lifecycle of a construction project—from planning and design to construction and maintenance.
6	Collaborative and multidisciplinary work	Embracing diverse perspectives and expertise enhances the industry's ability to address complex challenges and contribute to sustainable, resilient, and efficient infrastructure development.
7	Project management	Demonstrate knowledge and understanding of 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.





8	Communication	Ensures that all stakeholders are well-informed, promotes collaboration, and helps manage challenges effectively, ultimately contributing to the successful planning, design, and implementation of infrastructure projects.
9	Life-long learning	Recognize the need to have a natural drive to explore, learn and grow to improve self-quality of life and sense of self-worth by paying attention to the ideas and goals in the field of Civil Engineering.
10	Ethical practices and social responsibility	Understand the impact of professional engineering solutions in societal and ethical contexts and apply ethical principles and commit to professional ethics responsibilities and norms of engineering practice.
11	Independent and reflective learning	Recognize the need for and have the preparation and ability to Engage in independent and reflective learning in the broadest context of technological Change.



### 4. QUALIFICATION DESCRIPTORS:

The Master of Technology in Civil Engineering program is designed to provide students with advance education in the principles and practices of civil engineering. The qualification descriptor of the Master of Technology in Civil Engineering program includes:

### 1. Knowledge & Understanding:

- Demonstrate a dedicated understanding in field of civil engineering, its different learning areas and applications, and its linkages with related disciplinary areas/subjects.
- Demonstrate procedural knowledge that creates different types of professionals related to the specialized domain of civil engineering, including research and development, teaching and academics and also the industrial sector.
- Aware about eco-friendly construction materials, energy-efficient design, and sustainable urban development to address environmental concerns with emphasis on sustainable practices in civil engineering.

### 2. Technology & Skill:

- Exposes students to cutting-edge technologies and innovations in civil engineering. This may include advancements in materials, construction techniques, smart infrastructure, and the integration of digital tools like Building Information Modeling (BIM) and simulation software.
- Acquire knowledge of project management principles, including planning, scheduling, budgeting, and resource allocation. This prepares them for leadership roles in managing complex engineering projects.
- Acquire understanding of national and international codes and standards relevant to civil engineering practices. Adherence to these codes ensures that projects meet regulatory requirements and industry benchmarks.



### **3.** Communication and Competence:

- Development of effective communication and presentation skills. Students learn to convey complex engineering concepts to diverse audiences, including technical and non-technical stakeholders.
- Aware students to global challenges and international best practices in civil engineering. This includes exposure to case studies and projects from around the world, allowing students to apply a global perspective to their work.

Overall, Master of Technology in Civil Engineering program aims to produce graduates who possess a deep understanding of their chosen specialization, are capable of conducting independent research, and can apply their knowledge to address real-world civil engineering challenges. The curriculum is designed to balance theoretical knowledge with practical application, ensuring that graduates are well-prepared for leadership roles in academia, research, and industry.



### 5. PROGRAM OUTCOMES

PO No.	Attribute	Competency
PO1	Engineering knowledge	Student will be able to apply the knowledge of engineering to understand and analyse individual components related to the relevant specialization of Civil Engineering.
PO2	Research knowledge	Student will be able to carry out systematic research, design appropriate experiments and tools, and interpret experimental and analytical data for development of technological knowledge in civil engineering
PO3	Conduct research-based investigations of Complex Problems	Student will be able to design and conduct experiments, interpret, critically analyze data and carry out independent research on complex problems of civil engineering
PO4	Implementation of Advance Tools	Student will be able to create, adopt, and apply modern computational tools to analyze Civil engineering problems with understanding of limitations.
PO5	Engineer and Society	Student will comprehend their ethical and professional responsibilities while operating in inter-disciplinary engineering teams, with view on social responsibilities.
PO6	Life Long Learning	Students will be able to engage themselves in higher studies or life-long learning and keep on updating themselves with technological advance.



### 6. PROGRAM SPECIFIC OUTCOMES

PSO No.	Competency
PSO1	Graduates of the program will have in-depth knowledge to identify and formulate challenging problems in Structural/ Transportation/ Remote Sensing and GIS Engineering, apply appropriate research methodologies, use modern engineering tools and provide technically sound, economical and sustainable solutions.
PSO2	Graduates will have ability for higher studies and undertake high value research.
PSO3	Graduate of program will actively engage in a professional career as a Civil Engineer with sound analytical and lateral thinking ability to engage in lifelong learning for professional advancement to cope up with multidisciplinary and changing technologies in Civil Engineering.
PSO4	Graduates of the program will have sense of social responsibility, will demonstrate ability to communicate and work effectively as an individual or in a team having acquired leadership skills and manage projects in multidisciplinary environments.



### 7. COURSE STRUCTURE

### SEMESTER – I

Course	Course Title Credit					Marks		
Code		Distribution						ion
		( <b>H</b>	ours	s/We	ek)			
		L	Т	Р	С	IAE	ESE	Total
13160138	Research Methodology & IPR	3	0	0	3	40	60	100
13160107	Seminar	0	0	2	1	20	30	50
	noose these subjects for specialization in T		spoi			nginee	ring	
13160132	Pavement Materials	3	0	0	3	40	60	100
13160133	Urban Transportation System Planning	3	0	0	3	40	60	100
13160134	Geometric Design of Transportation					40	60	100
13100134	Facilities	3	0	0	3			
13160135	Ground Improvement	3	0	0	3	40	60	100
13160136	Pavement Materials Lab	0	0	2	1	20	30	50
13160137	Geometric Design Lab	0	0	2	1	20	30	50
	Choose these subjects for specialization i	n Sti	uct	ural	Engi	ineerin	g	
13160114	Advance Pre-Stressed Concrete Design	3	0	0	3	40	60	100
13160115	Structural Dynamics	3	0	0	3	40	60	100
13160116	Matrix Methods of Structural Analysis	3	0	0	3	40	60	100
13160117	Design of Concrete Structural Systems	3	0	0	3	40	60	100
13160118	Matrix Methods of Structural Analysis Lab (STAAD PRO)	0	0	2	1	20	30	50
13160119	Design of Concrete and Structural Systems Lab (STAAD PRO)	0	0	2	1	20	30	50
(	Choose these subjects for specialization in	Ren	note	Sen	sing	and G	IS	1
13160143	Principles of Remote Sensing	3	0	0	3	40	60	100
13160108	Geographical Information Systems	3	0	0	3	40	60	100
13160139	Photogrammetry	3	0	0	3	40	60	100
13160140	Application of Remote Sensing	3	0	0	3	40	60	100
13160141	Geographical Information Systems Lab	0	0	2	1	20	30	50
13160142	Photogrammetry Lab	0	0	2	1	20	30	50
	Total	15	0	6	18	260	390	650

Note – L: Lecture Hour/week, T: Tutorial Hour/week, P: Practical Hour/week, C: Credits, IAE: Internal Assessment Examination, ESE: End Semester Examination.



### SEMESTER – II

Course Code	Course Title		CreditDistribution(Hours/Week)LTPC		Marks Distribution			
		L			IAE	ESE	Total	
13160238	Minor Project	0	0	6	3	20	30	50

Т	ransportation Engineering (Choose these	sub	jects	for	spec	ializat	ion)	
13160232	Analysis and Design of Pavement	3	1	0	4	40	60	100
13160233	Transport Economics	3	0	0	3	40	60	100
13160234	Traffic Engineering and Management	3	0	0	3	40	60	100
13160235	Airport Infrastructure, Planning and					40	60	100
15100255	Design	3	0	0	3			
13160236	Pavement Design Lab	0	0	2	1	20	30	50
13160237	Traffic Lab	0	0	2	1	20	30	50

Structural Engineering (Choose these subjects for specialization)								
13160214	Finite Element Analysis	3	0	0	3	40	60	100
13160215	Theory of Elasticity and Plasticity	3	0	0	3	40	60	100
13160216	Limit State Design of Steel Structures	3	1	0	4	40	60	100
13160217	Earthquake Resistant Design	3	0	0	3	40	60	100
13160218	Structural Engineering lab (CASTING)	0	0	2	1	20	30	50
13160239	Finite Element Analysis Lab	0	0	2	1	20	30	50

	Remote Sensing and GIS (Choose the	ese subje	cts f	or s	pecia	lizatio	on)	
13160240	Geospatial Data Processing and					40	60	100
13100240	Modelling 3	3	1	0	4	40	00	100
13160241	Satellite Image Processing	3	0	0	3	40	60	100
13160242	Advanced GIS	3	0	0	3	40	60	100
13160243	GPS & Surveying	3	0	0	3	40	60	100
13160244	Advanced GIS Lab	0	0	2	1	20	30	50
13160245	Satellite Image Processing Lab	0	0	2	1	20	30	50

Total Credits for the semester	12	1	10	18	220	330	550
Note - L: Lecture Hour/week, T: Tutorial Hour/week, P: P	ractio	cal H	Hour/	week,	, C: Cr	edits, IA	AE: Intern

Assessment Examination, ESE: End Semester Examination.



### SEMESTER – III

Course Code	Course Title		istri	edit buti s/We	-	Di	Marks stribut	
		L	Τ	Р	С	IAE	ESE	Total
13160367	Dissertation Phase-I	0	0	12	6	20	30	50

,	Transportation Engineering (Choose these subjects for specialization)							
13160357	Intelligent Transportation Systems	3	1	0	4	40	60	100
Program El	ective-I Pool (Choose One from the pool)							
13160355	Construction Project Management & BOT							
13160368	Traffic Management and Road safety	3	0	0	3	40	60	100
13160359	Highway Construction Practices							
<b>Program El</b>	ective-II Pool (Choose One from the pool)							
13160369	Pavement Evaluation, Rehabilitation &							
13100309	Maintenance	3	0	0	2	40	(0)	100
13160363	3160363 Environment Impact Assessment		0		3	40	60	100
13160365	Bridge Engineering							

	Structural Engineering (Choose these subjects for specialization)							
13160305	Theory & Design of Plate and Shell31044060							100
Program Ele	ective-I Pool (Choose One from the pool)							
13160325	Pre-Fabricated Structures							
13160327	Design of Industrial Structures	3	3 0 0 3 40		40	60	100	
13160329	Maintenance & Rehabilitation of Structures							
<b>Program Ele</b>	ective-II Pool (Choose One from the pool)							
13160331	Design of Bridges							
13160333	Composite Structures	3	0	0	3	40	60	100
13160335	Design of Tall Buildings							

	Remote Sensing and GIS (Choose these subjects for specialization)							
13160370	Digital Image Processing31044					40	60	100
Program Elective-I Pool (Choose One from the pool)								
13160371	Web and Mobile GIS							
13160372	Argo Remote Sensing	3	0	0	3	40	60	100
13160373	Remote Sensing Geology							
Program Ele	ective-II Pool (Choose One from the pool)							
13160374	Global Navigation Satellite System							
13160375	Advanced Surveying and Cartography	3	0	0	3	40	60	100
13160376	Pattern Recognition and Machine Learning							

Total Credits for the semester	9	1	12	16	140	210	350
Note - L: Lecture Hour/week, T: Tutorial Hour/week, P: P	ractio	cal H	Hour/	week,	C: Cr	edits, IA	AE: Intern
Assessment Examination, ESE: End Semester Examination.							



### **SEMESTER – IV**

Course Code	Course Title	CreditMarksDistributionDistribution(Hours/Week)			-			
		L	Т	Р	С	IAE	ESE	Total
13160432	Dissertation Phase-II	0	0	16 Week	16	80	120	200
Total Credits for the semester		0	0	16 Week	16	80	120	200

Note – L: Lecture Hour/week, T: Tutorial Hour/week, P: Practical Hour/week, C: Credits, IAE: Internal Assessment Examination, ESE: End Semester Examination.

### **OVERALL CREDIT DISTRIBUTION TABLE**

SEMESTER	HOURS	HOURS PER WEEK		Total Credit	Marks Distribution			
	L	Т	Р	TC	IAE	ESE	Total	
SEMESTER – I	15	0	6	18	260	390	650	
SEMESTER – II	12	1	10	18	220	330	550	
SEMESTER – III	9	1	12	16	140	210	350	
SEMESTER – IV	-	-	-	16	80	120	200	
Total	36	2	28	68	700	1050	1750	

Note – L: Lecture Hour, T: Tutorial Hour, P: Practical Hour, TC: Total Credits, IAE: Internal Assessment Examination, ESE: End Semester Examination.



## 8. SEMESTER-WISE COURSE DETAILS SEMESTER - I

Course Code	Course Title
13160138	Research Methodology & IPR
13160107	Seminar
Choose th	nese subjects for specialization in Transportation Engineering
13160132	Pavement Materials
13160133	Urban Transportation System Planning
13160134	Geometric Design of Transportation Facilities
13160135	Ground Improvement
13160136	Pavement Materials Lab
13160137	Geometric Design Lab
Choose	e these subjects for specialization in Structural Engineering
13160114	Advance Pre-Stressed Concrete Design
13160115	Structural Dynamics
13160116	Matrix Methods of Structural Analysis
13160117	Design of Concrete Structural Systems
13160118	Matrix methods of Structural Analysis Lab (STAAD PRO)
13160119	Design of Concrete and Structural Systems Lab (STAAD PRO)
Choose	these subjects for specialization in Remote Sensing and GIS
13160143	Principles of Remote Sensing
13160108	Geographical Information Systems
13160139	Photogrammetry
13160140	Application Of Remote Sensing
13160141	Geographical Information Systems Lab
13160142	Photogrammetry Lab



		]	Facul	ty of Er	nginee	ring &	k Technol	logy					
Name of the l	Depart	ment		Civil	Engin	eering	<b>7</b>						
Name of the I	Progra	m		Mast	er of T	echno	ology in C	ivil Engi	neering (	Structural			
				Engi	Engineering)								
<b>Course Code</b>	Course Code					13160138							
Course Title Research Methodo							dology &	IPR					
Academic Ye	ar												
Semester		Ι											
Number of C	Credits 3												
<b>Course Prere</b>	equisite	<u>)</u>											
Course Syno	psis			The a	aim of	the c	ourse is to	o make s	tudents u	understand the			
				impo	rtance	of Re	search Pa	per Writ	ing. Also	o, it covers all			
				-				-	-	the Research			
				Pape									
Course Outco	mea			rupe									
At the end of		rea etur	lante	will be	bla to	•							
CO1							n research	•					
CO2	Collect data from samples, Examine and analyze the data.												
CO3		-		or probl									
<b>CO4</b> Explain the entire process in the form of a report.													
				-									
Mapping of Outcomes:				COs) to					: Progra	m Specific			
									2 Progra PSO3	m Specific PSO4			
Outcomes:	Course	Outco	mes (		Prog	ram (	Outcomes	(POs) &	_	_			
Outcomes: COs	Course PO1	Outcom PO2	mes (	PO4	Prog	ram ( PO6	PSO1	(POs) &	_	_			
Outcomes: COs CO1	PO1 3	Outcom PO2 3	mes ( PO3 -	PO4	Prog PO5 -	ram ( PO6 -	PSO1 3	(POs) & PSO2 3	PSO3	PSO4			
Outcomes: COs CO1 CO2	PO1 3 3	Outcom PO2 3 3	mes ( PO3 -	PO4 - -	Prog PO5 -	ram () PO6 - -	PSO1 3 3	(POs) & PSO2 3 3	PSO3	PSO4			
Outcomes: COs CO1 CO2 CO3 CO4	PO1 3 3 3	Outcon PO2 3 3 3	mes ( PO3 - - -	PO4 - - -	Prog PO5 - - -	ram ( PO6 - -	PSO1 3 3 3	(POs) & PSO2 3 3 3	PSO3	PSO4			
Outcomes: COs CO1 CO2 CO3	PO1 3 3 3 3 3	Outcon PO2 3 3 3 3 3	mes ( PO3 - - -	PO4 - - -	Prog PO5 - - -	ram ( PO6 - -	PSO1 3 3 3 3 3	(POs) & PSO2 3 3 3 3 3	PSO3	PSO4			
Outcomes: COs CO1 CO2 CO3 CO4 Average	PO1 3 3 3 3 3 3 3	Outcon PO2 3 3 3 3 3	mes ( PO3 - - -	PO4 - - -	Prog PO5 - - -	ram ( PO6 - -	PSO1 3 3 3 3 3	(POs) & PSO2 3 3 3 3 3	PSO3	PSO4			
Outcomes: COs CO1 CO2 CO3 CO4 Average Course Coi	PO1 3 3 3 3 3 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Outcon PO2 3 3 3 3 3 3	mes ( PO3 - - -	PO4 - - - - - -	PO5	ram ( PO6 - - - -	PSO1           3           3           3           3           3           3	(POs) & PSO2 3 3 3 3 3 3	PSO3	PSO4			
Outcomes: COs CO1 CO2 CO3 CO4 Average Course Coi	PO1 3 3 3 3 3 atomic statements ars/Wee	Outcon PO2 3 3 3 3 3 3	mes ( PO3 - - -	PO4 - - - - - - T (Hou	PO5	ram ( PO6 - - - -	PSO1 3 3 3 3 3 P (Hours	(POs) & PSO2 3 3 3 3 3 3 3 5/Week)	PSO3	PSO4 - - - - Hour/Week			
Outcomes: COs CO1 CO2 CO3 CO4 Average Course Con L (Ho	PO1 3 3 3 3 3 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Outcon PO2 3 3 3 3 3 3	mes ( PO3 - - -	PO4 - - - - - - T (Hou	PO5	ram ( PO6 - - - -	PSO1 3 3 3 3 P (Hours 0	(POs) & PSO2 3 3 3 3 3 3 5/Week)	PSO3	PSO4			
Outcomes: COs CO1 CO2 CO3 CO4 Average Course Con L (Ho Unit	PO1 3 3 3 3 3 atomic statements ars/Wee	Outcon PO2 3 3 3 3 3 3 k)	mes ( PO3 - - - -	PO4 - - - - - T (Hou	<ul> <li>Prog</li> <li>PO5</li> <li>-</li> <li>-</li> <li>-</li> <li>-</li> <li>-</li> <li>-</li> <li>-</li> <li>-</li> <li>-</li> <li>0</li> </ul>	ram ( PO6 - - - - k)	PSO1 PSO1 3 3 3 3 P (Hours 0 Content	(POs) & PSO2 3 3 3 3 3 3 5/Week)	PSO3	PSO4 - - - - Hour/Week 3			
Outcomes: COs CO1 CO2 CO3 CO4 Average Course Con L (Ho	PO1 3 3 3 3 3 atomic statements ars/Wee	Outcon PO2 3 3 3 3 3 3 k) Lefin	mes ( PO3 - - - - - - - - - - -	PO4 T (Hou	Prog PO5 - - - - - - - - - - - - - - - - - - -	ram C PO6 k) Reme	PSO1 PSO1 3 3 3 3 P (Hours 0 Content mber), C	(POs) & PSO2 3 3 3 3 3 5/Week) Classify	PSO3 Total research,	PSO4 and discuss			
Outcomes: COs CO1 CO2 CO3 CO4 Average Course Con L (Ho Unit	PO1 3 3 3 3 3 atomic statements ars/Wee	Outcon PO2 3 3 3 3 3 3 k) k)	mes ( PO3 - - - - - e Re urch J	PO4 T (Hou	Prog PO5 - - - - - - - - - - - - - - - - - - -	ram C PO6 k) Reme steps	PSO1           3           3           3           3           3           3           3           3           3           3           3           3           3           3           Content           mber), C           (C2, Und	(POs) & PSO2 3 3 3 3 3 3 3 5/Week)	PSO3 Total research,	PSO4 - - - - Hour/Week 3			
Outcomes: COs CO1 CO2 CO3 CO4 Average Course Con L (Ho Unit	PO1 3 3 3 3 3 atomic statements ars/Wee	Outcon PO2 3 3 3 3 3 3 3 k) k) Lefin Resea Resea	mes ( PO3 - - - - - - - - - - - - - - - - - - -	PO4	Prog PO5 - - - - - - - - - - - - - - - - - - -	ram C PO6 k) Reme steps pects	PSO1           3           3           3           3           3           3           3           3           0           Content           mber), C           (C2, Under           (C2, Under	(POs) & PSO2 3 3 3 3 3 3 3 5/Week) Classify terstand), erstand)	PSO3	PSO4			
Outcomes: COs CO1 CO2 CO3 CO4 Average Course Con L (Ho Unit	PO1 3 3 3 3 3 atomic statements ars/Wee	Outcon PO2 3 3 3 3 3 3 3 3 4 k) Exercised Resea Resea Descri	mes ( PO3 - - - - - - - - - - - - - - - - - - -	PO4 T (How - search process roposal Researc	Prog PO5 - - - - - - - - - - - - - - - - - - -	ram C PO6 k) Reme steps pects sign-	PSO1           3           3           3           3           3           3           3           3           3           3           3           3           3           3           3           3           3           0           Content           mber), C           (C2, Under           Need, P	(POs) & PSO2 3 3 3 3 3 3 5/Week) Classify lerstand) roblem	PSO3	PSO4 - - - - - Hour/Week 3 and discuss h Hypothesis, on, Variables,			
Outcomes: COs CO1 CO2 CO3 CO4 Average Course Con L (Ho Unit	PO1 3 3 3 3 3 atomic statements ars/Wee	Outcon PO2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	mes ( PO3 - - - - - - - - - - - - - - - - - - -	PO4 - - - - - - - - - - - - -	Prog PO5 - - - - - - - - - - - - - - - - - - -	ram C PO6	PSO1           3           3           3           3           3           3           3           3           3           3           3           3           3           3           3           3           3           4           0           Content           mber), C           (C2, Underst           (C2, Underst           2, Underst	(POs) & PSO2 3 3 3 3 3 3 3 5/Week) Elassify lerstand), roblem cand), Us	PSO3	PSO4 - - - - - - - - - - - - -			
Outcomes: COs CO1 CO2 CO3 CO4 Average Course Con L (Ho Unit	PO1 3 3 3 3 3 atomic statements ars/Wee	Outcon PO2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	mes ( PO3 - - - - - - - - - - - - - - - - - - -	PO4 - - - - T (Hour - - T (Hour - - - - - - - - - - - - -	Prog PO5 - - - - - - - - - - - - - - - - - - -	PO6     -<	PSO1 PSO1 3 3 3 3 P (Hours 0 Content mber), C (C2, Und (C2, Und (C2, Und (C2, Underst lain Rese	(POs) & PSO2 3 3 3 3 3 3 5/Week) Elassify lerstand), roblem cand), Us arch des	PSO3	PSO4 - - - - - Hour/Week 3 and discuss h Hypothesis, on, Variables,			



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	models, model building and stages, Data consideration (C4, Analyze)
2	Discuss Sampling and data collection (C2, Understand)- Compare the
	Techniques of sampling, Random, Stratified, Systematic, Multistage-
	sampling, Primary and secondary sources of data (C4, Analyze), Design
	of questionnaire (C6, Create)
3	Design of Experiments- Objectives, strategies (C6, Create ), Examine
	Factorial experimental design, designing engineering experiments, basic
	principles-replication, randomization, blocking, guidelines for the
	design of experiments (C4, Analyze)
4.	Discuss and explain Single factor experiment- Hypothesis testing,
	analysis of Variance component (ANOVA) for fixed effect model;
	Total, treatment and error of squares, Degrees of freedom, Confidence
	interval; ANOVA for random effect model, estimation of variance
	components, Model adequacy checking (C2, Understand)
	Examine the Structure and components of Scientific Reports (C4,
	Analyze), compare the Types of Report, Technical Reports and Thesis
	(C4, Analyze); Distinguish Different steps in the preparation – Layout,
	structure and Language of typical reports; Illustrations and tables,
	Bibliography, Referencing and foot notes (C4, Analyze)

<b>Teaching - Learning Strategies</b>	Contact Hours
Lecture	25
Practical	
Seminar/Journal Club	
Small group discussion (SGD)	
Self-directed learning (SDL) / Tutorial	
Problem Based Learning (PBL)	8
Case/Project Based Learning (CBL)	12
Revision	6
Others If any:	
Total Number of Contact Hours	45

Formative	Summative
Multiple Choice Questions (MCQ)	Mid Semester Examination 1
Viva-voce	Mid Semester Examination 2
Objective Structured Practical Examination	University Examination
Quiz	Dissertation
Seminars	Multiple Choice Questions (MCQ)
Problem Based Learning (PBL)	Short Answer Questions (SAQ)
Journal Club	Long Answer Question (LAQ)
	Practical Examination & Viva-voce



CO1	CO2	CO3	CO4	

**Objective Structured Practical Examination** 

VIVA						
Assignment / Presentation	✓	✓	✓	✓		
Unit test	✓	•	✓	<ul> <li>✓</li> </ul>		
Practical Log Book/ Record Book						
Mid Semester Examination 1	✓	•	<ul> <li>✓</li> </ul>	•		
Mid Semester Examination 2	✓	•	✓	<ul> <li>✓</li> </ul>		
University Examination	✓	✓	✓	<ul> <li>✓</li> </ul>		
	1	I	I	1	1	1
Feedback Process	1. Student's Feedback					

Students Feedback is taken through various steps

Mapping of Assessment with COs

**Nature of Assessment** 

Quiz

- 1. Regular feedback through Mentor Mentee system
- 2. Feedback between the semester through Google forms

References:	
	<b>Text Books</b> 1. Research Methodology – Methods and Techniques – C.R. Kothari, New Age International, New Delhi, 2004.
	Reference Books
	<ol> <li>Design and Analysis of Experiments – Douglas C. Montgomery, Wiley India, 8th Edition, 2012.</li> <li>Practical Research: Planning Design – Paul D. Leddy, London, 1980.</li> </ol>



# Master of Technology in Civil Engineering (Transportation Engineering) 1<sup>st</sup> Semester



			Fac				g & Techn	ology			
Name of th	ie Dep										
Name of th	gram		Μ	Master of Technology in Civil Engineering (Transportation							
					ngineer	ring)					
<b>Course Co</b>	de			13	816013	2					
<b>Course Tit</b>	le			Pa	veme	nt Ma	terials				
Academic	cademic Year I										
Semester				Ι							
Number of	Cred	its		3							
<b>Course Pro</b>	erequi	site		Sc	oil Mec	chanics	and concre	te technol	ogy		
Course Sy										test on road	
·	-					-	men materi	-	•		
					0.0	-,					
Course Ou											
At the end											
CO1		entify d		-							
CO2	1						ze pavemer				
CO3							for differen	<u> </u>	<u> </u>	ocedures.	
<b>CO4</b>	De	evelop s	suitable	perfor	rmance	e tests	and materia	l specifica	tions.		
Mapping o	of Cou	rse Out	tcomes	(COs)	) to Pr	ogram	Outcomes	(POs) &l	Program S	pecific	
<b>Outcomes:</b>					1	1		1	-		
COs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	
CO1	3	3	2	2	1	1	2	2	3	3	
CO2	3	3	2	2	1	1	2	2	3	3	
CO3	3	3	2	2	1	1	2	2	3	3	
CO4	3	3	2	2	1	1	2	2	3	3	
Average	3	3	2	2	1	1	2	2	3	3	
Course C	Conter	nt:							1		
L (1	Hours/V	Week)		T (I	Hours/V	Veek)		rs/Week)	Total Hour/Week		
	3				0			0		3	
Uni	it						Conter				
1					-					Explain soil	
					-	-			erstand), Di	scuss Origin,	
					1		nts (C2, Un	,			
2			-	-	perties and tests on road aggregates (C1, Remember), Explain						
		0.	00		lassification (C2, Understand), Discuss volumetric analysis of						
			gregate								
3				-						Understand),	
			-						•	onstituent of	
										mulsions and	
				: Dem	onstra	te prej	paration, ch	aracteristi	cs, uses ar	nd tests (C3,	
		Ap	oply).								



4	State Mechanical properties (C1, Remember) –Define Resilient modulus,
	dynamic modulus and fatigue characteristics of bituminous mixes (C1,
	Remember). Demonstrate Weathering and Durability of Bituminous
	Materials and Mixes (C3, Apply) –Differentiate Performance based
	Bitumen Specifications (C4, Analyze) – Develop Super pave mix design
	method (C6, Create)

Teaching - Learning Strategies	Contact Hours
Lecture	35
Practical	
Seminar/Journal Club	
Small group discussion (SGD)	2
Self-directed learning (SDL) / Tutorial	2
Problem Based Learning (PBL)	4
Case/Project Based Learning (CBL)	2
Revision	
Others If any:	
Total Number of Contact Hours	45

Formative	Summative
Quiz	Mid Semester Examination 1
Seminars	Mid Semester Examination 2
Problem Based Learning (PBL)	University Examination
	Short Answer Questions (SAQ)
	Long Answer Question (LAQ)



### Mapping of Assessment with COs

Nature of Assessment	CO1	CO2	CO3	CO4			
Quiz	✓	✓	✓	✓			
VIVA							
Assignment / Presentatio	n 🗸	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>			
Unit test	✓	✓	✓	<ul> <li>✓</li> </ul>			
Practical Log Book/ Reco	ord Book						
Mid Semester Examination	on 1 🗸	✓	✓	<ul> <li>✓</li> </ul>			
Mid Semester Examination	on 2 🗸	✓	✓	<ul> <li>✓</li> </ul>			
University Examination	✓	✓	✓	<ul> <li>✓</li> </ul>			
Feedback Process	1. Stu	1. Student's Feedback					
Students Feedback is tak	en through various s	steps					
1. Regular feedback	•	-					
2. Feedback between	n the semester throu	igh Google fo	orms				
References:							
1. S.J chan 2. S. Pave <b>Refe</b> 1. M Wile 2. IR	<ul> <li>Text Books <ol> <li>S.K. Khanna &amp; C.E.G. Justo, Highway Engineering, Name chand &amp; Bros. publication.</li> <li>S.K. Khanna &amp; C.E.G. Justo, Highway Materials and Pavement Testing, Name chand &amp; Bros. publication.</li> </ol> </li> <li>Reference Books <ol> <li>Martin Rogers and Bernard Enright, Highway Engineering, Wiley publication.</li> <li>IRC, "Steel Fiber Reinforced Concrete for Pavements", IRC: SP – 46, 1997, Indian Road Congress.</li> </ol> </li> </ul>						



			F	aculty	of En	gineer	ing & Tecl	hnology			
Name of th	ne Dep	e Department Civil Engineering									
Name of th	ne Pros	gram		Mast	er of T	<i>Techno</i>	logy in Civ	il Engineer	ing (Transp	ortation	
	,				neering		0.	e			
Course Co	de			Ŭ	0133						
Course Tit						nspor	tation Syst	em Planni	ng		
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Number of	f Credi										
Course Pr											
Course Sy	<b>_</b>	5100					•	•	an users. T	rip analysis and	
eourse sj	ropoio					0	1			s transit system	
					-		ut selection.		isn'y or mus	s claiste system	
Course Ou	itcome	s:		in ur	oun ur	<i>ub</i> , 100		•			
At the end			studen	ts will	be able	e to:					
CO1	1	ify urba									
CO2							ivel demand	1 models			
CO2		ate urb				1 01 110		<i>i</i> 1110 de 15.			
CO4		urban tr									
C04 C05			_			e and r	renare urb	an transnor	tation plans		
				1		1	-	1	Program S		
Outcomes						0			0	•	
COs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	
CO1	3		2	2	3		2	2	3	3	
CO2	3		2	3	3		2	2	3	3	
CO3	3		2	3	2		2	2	3	3	
CO4	3		2	2	2		2	2	3	3	
CO5	3		2	3	2		2	2	3	3	
			•	• •							
Average	3		2	2.6	2.4		2	2	3	3	
Average	3		2	2.6	2.4		2	2	3	3	
		nt:	2	2.6	2.4		2	2	3	3	
Course C	Conter				1		1		-		
Course C	Conter			T (Hou	ırs/Wee	k)	P (Hours	s/Week)	-	Hour/Week	
Course C L (H	Conter ours/Wo			T (Hou	urs/Wee 0		P (Hours 0	s/Week)	Total	Hour/Week 3	
Course C L (H Unit	Conter ours/Wo	eek)		T (Hou	urs/Wee 0 (	Conten	P (Hours 0 t	;/Week)	Total	Hour/Week 3 ompetencies	
Course C L (H	Conter ours/Wo	eek)	e Ma	T (Hou ss tra	urs/Wee 0 0 nsit s	Conten systems	P (Hours 0 t s (C1,Ren	Week)	Total Co Discuss El	Hour/Week 3 ompetencies ements /	
Course C L (H Unit	Conter ours/Wo	eek) Defin comp	e Ma onents	T (Hou ss tra of tra	urs/Wee 0 0 nsit s unsit sy	Conten systems	P (Hours 0 it s (C1,Ren (C2, Unde	week) hember), 1 erstand); D	Total Co Discuss El Describe Ur	Hour/Week 3 ompetencies ements / ban Mass	
Course C L (H Unit	Conter ours/Wo	eek) Defin comp Trans	e Ma onents it sys	<b>T</b> (House ss trans of trans terms	nsit sy (C2,	Conten systems ystems Unders	P (Hours 0 nt s (C1,Ren (C2, Undo stand)-Expl	/Week) nember), 1 erstand); D ain the t	Total Co Discuss El Describe Ur ypes, chara	Hour/Week 3 ompetencies ements / ban Mass acteristics,	
Course C L (H Unit	Conter ours/Wo	eek) Defin compo Trans suitab	e Ma onents it sys ility	T (Hou ss tra of tra tems and	rs/Wee 0 0 nsit s nsit sy (C2, 1 adapta	Conten systems ystems Unders bility	P (Hours 0 tt s (C1,Ren (C2, Undo stand)-Expl of these	week) nember), 1 erstand); D ain the ty systems	Total Co Discuss El Describe Ur ypes, chara (C2, Un	Hour/Week 3 ompetencies ements / ban Mass acteristics,	
Course C L (H Unit	Conter ours/Wo	eek) Defin compo Trans suitab	e Ma onents it sys ility	T (Hou ss tra of tra tems and	rs/Wee 0 0 nsit s nsit sy (C2, 1 adapta	Conten systems ystems Unders bility	P (Hours 0 nt s (C1,Ren (C2, Undo stand)-Expl	week) nember), 1 erstand); D ain the ty systems	Total Co Discuss El Describe Ur ypes, chara (C2, Un	Hour/Week 3 ompetencies ements / ban Mass acteristics,	
Course C L (H Unit	Conter ours/Wo	eek) Defin compo Trans suitab Demo	e Ma onents it sys ility onstrate	T (Hou ss tra of tra tems and a the ev	nsit synchroniae (C2, 1) adaptal volutio	Conten systems ystems Unders bility n of ur	P (Hours 0 at s (C1,Ren (C2, Unde stand)-Expl of these ban transpo	Week) nember), 1 erstand); D ain the ty systems ortation (C3	Total Co Discuss El Describe Ur ypes, chara (C2, Un 3, Apply).	Hour/Week 3 ompetencies ements / ban Mass acteristics,	



	Data collection (C3, Apply); Describe Medium performance transit systems and high performance transit systems (C2, Understand); Investigate trends in transit planning (C6, Create).
3	Design transit demand forecasting (C6, Create); Discuss transit mode evaluation (C2, Understand); Examine the comparison and selection of most suitable transit mode (C4, Analyze).
4	Define Basic operational elements (C1, Remember); Discuss transit travel characteristics (C2, Understand); Define transit scheduling (C1, Remember); Discuss transit line analysis (C2, Understand) – Explain planning objectives, geometry, types and their characteristics, capacity of transit lines, system procedures for improving transit line capacity (C2, Understand).

Teaching - Learning Strategies	Contact Hours
Lecture	33
Practical	
Seminar/Journal Club	2
Small group discussion (SGD)	2
Self-directed learning (SDL) / Tutorial	
Problem Based Learning (PBL)	4
Case/Project Based Learning (CBL)	4
Revision	
Others If any:	
Total Number of Contact Hours	45

Formative	Summative
Objective Structured Practical Examination	Mid Semester Examination 1
Quiz	Mid Semester Examination 2
Seminars	University Examination
Problem Based Learning (PBL)	Short Answer Questions (SAQ)
	Long Answer Question (LAQ)



### Mapping of Assessment with COs

Nature of Assessment		CO1	CO2	CO3	<b>CO4</b>	CO5	
Quiz	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓	<ul> <li>✓</li> </ul>		
VIVA							
Assignment / Prese	ntation	✓	<ul> <li>✓</li> </ul>	✓	✓	✓	
Unit test		✓	<ul> <li>✓</li> </ul>	✓	✓	<ul> <li>✓</li> </ul>	
Practical Log Book	/ Record Book						
Mid Semester Exam	nination 1	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	
Mid Semester Exar	Mid Semester Examination 2		<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	
University Examina	ation	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓	<ul> <li>✓</li> </ul>	✓	
Feedback Process		1. Student's Feedback					
	is taken through dback through M etween the semes	entor M	entee sys				
References:							
	Text Books 1. C A O'Flaher Butter worth He 2. John W. Dick Planning", Tata Reference Books 1. C Jotin Khist Prentice Hall of	einemann cey and c McGrav s y and B	n, Burling others, "N w-Hill Bo Kent Lall	gton. Aetropoli ook Comp I, "Transj	tan Tran bany Ltd	sportation ., New Delhi	



			Fac	ulty of	Engin	eering	& Technol	logy		
Name of the Department					Civil Engineering					
Name of th					Master of Technology in Civil Engineering (Transportation					
					Engineering)					
Course Co	de				60134	U l				
<b>Course Tit</b>				Ge	ometri	c Desi	gn of Tran	sportation	<b>Facilities</b>	
Academic	Year			Ι			0	1		
Semester				Ι						
Number of	f Cred	its		3						
Course Pr	erequi	site		Sur	veying	, High	way Engine	ering		
Course Sy							ion, Unders		e various g	overnment
· ·	•						geometric o			
				-			lements, sig	-	-	
					ntersec					.,
				011						
Course Ou	itcome	s:								
At the end										
CO1							d design ele		<u> </u>	nd streets
CO2							signalized i	intersection	ns.	
CO3	Pla	an and I	Design	parking	g facilit	ies.				
CO4	De	esign st	reet lig	hting sy	stem fo	or road	ls.			
Mapping of	of Cou	rse Out	tcomes	(COs)	to Pro	gram	Outcomes (	(POs) & P	rogram Sp	ecific
<b>A</b> ·										
Outcomes		•							-	
Outcomes: COs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
COs	PO1									
COs CO1		3	2	2	PO5 2 3	1	PSO1 2 2	PSO2 2 2 2	PSO3 3 3	3
COs CO1 CO2	PO1 2	3 3	2 3	2 3	2 3	1 3	2	2	3 3	3 3
COs CO1	PO1 2 1	3 3 3	2	2	2	1	2 2 2	2 2 2 2	3 3 3	3 3 3
COs CO1 CO2 CO3 CO4	PO1 2 1 2	3 3	2 3 3 3	2 3 3 3	2 3 2 3	1 3 3	2 2	2 2	3 3	3 3
COs CO1 CO2 CO3	PO1 2 1 2 1 1 1	3 3 3 3	2 3 3	2 3 3	2 3 2	1 3 3 1	2 2 2 2 2	2 2 2 2 2 2	3 3 3 3 3	3 3 3 3 3
COs CO1 CO2 CO3 CO4 Average	PO1 2 1 2 1 1 1.5	3 3 3 3 3	2 3 3 3	2 3 3 3	2 3 2 3	1 3 3 1	2 2 2 2 2	2 2 2 2 2 2	3 3 3 3 3	3 3 3 3 3
COs CO1 CO2 CO3 CO4 Average Course C	PO1 2 1 2 1 1.5 Conter	3 3 3 3 3 nt:	2 3 3 3	2 3 3 2.75	2 3 2 3 2.5	1 3 1 2	2 2 2 2 2 2	2 2 2 2 2 2 2	3 3 3 3 3 3	3 3 3 3 3
COs CO1 CO2 CO3 CO4 Average Course C	PO1 2 1 2 1 1.5 Conter Hours/V	3 3 3 3 3 1 3	2 3 3 3	2 3 3 2.75	2 3 2 3 2.5	1 3 1 2	2 2 2 2 2 2 2	2 2 2 2 2 2 2 s/Week)	3 3 3 3 3	3 3 3 3 3 ur/Week
COs CO1 CO2 CO3 CO4 Average Course C L (	PO1 2 1 2 1 1.5 Conter	3 3 3 3 3 1 3	2 3 3 3	2 3 3 2.75	2 3 2 3 2.5	1 3 3 1 2 7eek)	2 2 2 2 2 2 2 2	2 2 2 2 2 2 2 s/Week)	3 3 3 3 3 Total Ho	3 3 3 3 3 ur/Week 8
COs CO1 CO2 CO3 CO4 Average Course C	PO1 2 1 2 1 1.5 Conter Hours/V	3 3 3 3 3 3 mt: Week)	2 3 3 2.75	2 3 3 2.75 T (H	2 3 2 3 2.5 Lours/W 0 C	1 3 1 2 Veek)	2 2 2 2 2 2 2 2 2	2 2 2 2 2 2 2 3/Week)	3 3 3 3 3 3 Total Ho 3 Compo	3 3 3 3 3 ur/Week 3 etencies
COs CO1 CO2 CO3 CO4 Average Course C L (1 Unit	PO1 2 1 2 1 1.5 Conter Hours/V	3 3 3 3 3 mt: Week)	2 3 3 2.75	2 3 3 2.75 T (H	2 3 2 3 2.5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	1 3 3 1 2 7 eek) ontent	2 2 2 2 2 2 2 2 2 4 4 4 4 4 4 4 4 4 4 4	2 2 2 2 2 2 2 3/Week) 0 5/Week)	3 3 3 3 3 3 Total Ho 3 Compe Remember)	3 3 3 3 3 ur/Week 3 etencies , Explain
COs CO1 CO2 CO3 CO4 Average Course C L (1 Unit	PO1 2 1 2 1 1.5 Conter Hours/V	3 3 3 3 3 mt: Week)	2 3 3 2.75 ate Pa	2 3 3 2.75 T (H	2 3 2 3 2.5 Iours/W 0 Cos surf ection	1       3       1       2   Veek)       ontent       ace c       eleme	2 2 2 2 2 2 2 2 2	2 2 2 2 2 2 2 2 5/Week) 0 cs (C1, 1 r, carriage	3       3       3       3       3       3       3       Compo       Remember)       eway width	3 3 3 3 3 ur/Week 3 etencies , Explain h, median,
COs CO1 CO2 CO3 CO4 Average Course C L (1 Unit	PO1 2 1 2 1 1.5 Conter Hours/V	3 3 3 3 3 3 <b>nt:</b> Week)	2 3 3 2.75 ate Pa rious o rbs, ro	2 3 3 2.75 T (H vements cross se pad mar	2 3 2 3 2.5 Tours/W 0 C s surf ection rgins,	1       3       1       2   Veek)       ontent       ace     c       eleme     safety	2 2 2 2 2 2 2 2 2 4 4 4 4 4 4 4 4 4 4 4	2 2 2 2 2 2 2 2 5/Week) 0 cs (C1, 1 r, carriage and others	3       3       3       3       3       3       3       Compo       Remember)       eway width       (C2, Ur	3 3 3 3 3 ur/Week s etencies , Explain h, median, hderstand),
COs CO1 CO2 CO3 CO4 Average Course C L (1 Unit	PO1 2 1 2 1 1.5 Conter Hours/V	3 3 3 3 3 mt: Week)	2 3 3 2.75 ate Pa rious o rbs, ro escribe	2 3 3 2.75 T (H vements cross so bad man IRC gui	2 3 2 3 2.5 Tours/W 0 Cos surf ection rgins, ideline	1       3       1       2       Veek)         ontent       ace       eleme       safety       s for cr	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2 2 2 2 2 2 2 2 2 2 2 5/Week) 0 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	3       3       3       3       3       3       3       Compo       Remember)       eway width       (C2, Urder)       s (C2, Under)	3 3 3 3 3 3 ur/Week s etencies , Explain h, median, hderstand), erstand).
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COs CO1 CO2 CO3 CO4 Average Course C L ( Unit	PO1 2 1 2 1 1.5 Conter Hours/V	3 3 3 3 3 mt: Week) Sta Va ke De dis	2 3 3 2.75 ate Pa arious of rbs, ro escribe offine Stance	2 3 3 2.75 T (H vements cross se pad mai IRC gui topping (C1, 1	2 3 2 3 2.5 tours/W 0 C s surf ection rgins, ideline: sight Remen	1       3       1       2   Veek)       ontent       ontent       oace       c       eleme       safety       s       for       c       distand       ber),	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         Compo         Remember)         eway width         s) (C2, Urded)         Define Pass         sight dista	3 3 3 3 3 3 ur/Week etencies , Explain h, median, nderstand), erstand). ssing signt ance (C1,
COs CO1 CO2 CO3 CO4 Average Course C L ( Unit	PO1 2 1 2 1 1.5 Conter Hours/V	3 3 3 3 3 mt: Week) Sta Va ke: De dis Re sig	2 3 3 2.75 ate Pa rious of rbs, roc escribe offine S atance member ht triar	2 3 3 2.75 T (H vements cross se bad mar IRC gui topping (C1, 1 er), Def ngle (C2	2 3 2 3 2.5 Tours/W 0 Coss surf ection rgins, ideline sight Remen ine hea b, Unde	1         3         1         2         7eek)         ontent         ace c         eleme         safety         s for cr         distand         ber),         adlight         orstand	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         Compo         Remember)         eway width         s) (C2, Ur         s (C2, Under         Define Pass         sight dista         Remember)	3 3 3 3 3 3 ur/Week 3 etencies , Explain h, median, herstand), erstand). ssing signt ance (C1, , Describe



	(C2, Understand), Define transition curve (C1 Remember), Discuss back- sight distance vertical curves (summit & valley curve) (C2, Understand).
4.	Describe the Types of un-signalized intersection (C1, Remember), Demonstrate sight distance consideration, channelization(C3, Apply), Define mini roundabouts (C1, Remember), Design the layout of roundabouts (C6, Create), Discuss Inter-changes: major and minor interchanges, entrance and exit ramps, acceleration and deceleration lanes (C2, Understand)

Teaching - Learning Strategies	Contact Hours	
Lecture	38	
Practical		
Seminar/Journal Club		
Small group discussion (SGD)		
Self-directed learning (SDL) / Tutorial		
Problem Based Learning (PBL)	3	
Case/Project Based Learning (CBL)	4	
Revision		
Others If any:		
Total Number of Contact Hours	45	

Formative	Summative
Quiz	Mid Semester Examination 1
Seminars	Mid Semester Examination 2
Problem Based Learning (PBL)	University Examination
	Short Answer Questions (SAQ)
	Long Answer Question (LAQ)



### Mapping of Assessment with COs

Nature of Assessmen	CO1	CO2	CO3	CO4		
Quiz	✓	<b>√</b>	<ul> <li>✓</li> </ul>	✓		
VIVA						
Assignment / Present	ation	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓	
Unit test		✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	
Practical Log Book/ I	Record Book					
Mid Semester Exami	nation 1	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	
Mid Semester Exami	nation 2	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	
University Examinati	on	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	
Feedback Process		1. Student's Feedback				
Students Feedback is 1. Regular feedb 2. Feedback betw	ack through M	lentor M	entee sys			
References:						
	chand & Bros. 2. AASHO, A	publicat policy o ociation <b>ks</b> and IRC	tion. n Geome of State P C codes	tric Desig	y Engineering, Name gn of Rural Highway, Officials; Washington.	



Faculty of Engineering & Technology				
Name of the DepartmentCivil Engineering				
Name of the ProgramMaster of Technology in Civil Engineering				
	(Transportation Engineering)			
Course Code	13160135			
Course Title	Ground Improvement			
Academic Year	Ι			
Semester	Ι			
Number of Credits	3			
Course Prerequisite	Soil Mechanics			
Course Synopsis	Soil Mechanistic properties, Soil drainage characteristics,			
	Soil stabilization methods and deep exploration.			
Course Outcomes:				

Course Outcomes:

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

**CO1** Understand sub grade soil properties by using various tests.

CO2 Understand various soil stabilization techniques.

**CO3** Learn ground improvement methods.

**CO4** Reinforcement of soil to increase its load bearing capacity.

Mapping of Course Outcomes (COs) to Program Outcomes (POs) & Program Specific Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	2	3	3	3	2	1	2	2	3	3
CO2	2	3	3	3	3	3	2	2	3	3
CO3	2	3	3	3	2	3	2	2	3	3
CO4	2	3	3	3	3	1	2	2	3	3
Average	2	3	3	3	2.5	2	2	2	3	3

### **Course Content:**

L (Hours/Wee	k)	T (Hours/Week)	P (Hours/Week)	Total Hour/Week			
3		0	0	3			
Unit		Content		Competencies			
1.	Compare	the Engineering pro	perties of soft (C4, A	Analyze), Describe the			
	weak and	d compressible depo	sits and problems	associated with weak			
	deposit (C2, Understand), Investigate the Requirements of ground						
	improver	nents (C6, Create)	– explain and i	dentify the different			
	engineeri	ng ground modificat	ion, need and objecti	ves (C2, Understand).			
2.	Describe	soil stabilization (C	2, Understand), Con	mpare and investigate			
	the diffe	erent stabilization/m	odification techniq	ues i.e. mechanical			
	modificat	tion, Hydraulic mod	ification, Dewaterin	ng systems, Chemical			
	modificat	tion, Modification by	y admixtures like lii	me, Cement, Bitumen			
	etc. (C4,	Analyze, C6, Create	), Describe Grouting	g and Deep jet mixing			



A+

	method (C2, Understand).
3.	Explain and Compare the recent Ground improvement techniques-
	stabilization using industrial waste (C2, Understand; C4, Analyze),
	Examine the modification by inclusion and confinement – soil nailing –
	stone column - compaction piles - dynamic compaction - prefabricated
	vertical drains - preloading - electro - osmosis - soil freezing vacuum
	consolidation - deep explosion - dry powdered polymers - enzymes
	(C4, Analyze)
4.	Describe the concept of reinforced earth and Mechanisms (C2,
	Understand), Differentiate the various types of reinforcements – Soil –
	Reinforcement - Interaction studies (C4, Analyze), Investigate the
	Internal & External stability criteria – Design Principles of steep
	reinforced soil slops - pavements - Embankments on soft soils (C2,
	Understand; C6, Create)

Teaching - Learning Strategies	Contact Hours			
Lecture	35			
Practical				
Seminar/Journal Club				
Small group discussion (SGD)				
Self-directed learning (SDL) / Tutorial	3			
Problem Based Learning (PBL)	3			
Case/Project Based Learning (CBL)	4			
Revision				
Others If any:				
Total Number of Contact Hours	45			

Formative	Summative
Quiz	Mid Semester Examination 1
Seminars	Mid Semester Examination 2
Problem Based Learning (PBL)	University Examination
	Short Answer Questions (SAQ)
	Long Answer Question (LAQ)



### Mapping of Assessment with COs

Nature of Assessn	CO1	CO2	CO3	CO4				
Quiz	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓	✓				
VIVA								
Assignment / Prese	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓	✓				
Unit test		✓	<ul> <li>✓</li> </ul>	✓	✓			
Practical Log Book	k/ Record Book							
Mid Semester Exam	mination 1	✓	<ul> <li>✓</li> </ul>	✓	✓			
Mid Semester Exam	mination 2	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓	✓			
University Examin	University Examination			✓	✓			
Feedback Process		1. Stu	1. Student's Feedback					
Ũ	is taken through dback through N etween the seme (List of books)	Mentor M ester throu	entee syst					
Kelerences:	(List of books)							
	Text Books							



			Fac	ulty of I	Engin	eering &	& Technolog	gy		
Name of th	ne Dep	artmen								
Name of th	ie Prog	gram		Ma	ster of	Techno	logy in Civi	l Enginee	ring (Transp	oortation
		-		Eng	gineeri	ng)				
<b>Course Co</b>	de			131	60136					
<b>Course Tit</b>	le			Pav	vemen	t Mater	ials Lab			
Academic	Year			Ι						
Semester				Ι						
Number of	f Credi	its		1						
Course Pro	erequi	site		Hig	ghway [	Enginee	ring lab			
Course Sy	nopsis			Tes	sts on a	Iggregat	e to determi	ine mecha	anical prope	rties Test
_				on	binding	g materi	al and test o	n soil.		
						-				
Course Ou					1. 1 4					
At the end										
CO1				paveme				4	4	
CO2							ent and pav			
CO3				-			istics of in-s	-		
CO4				-			stics of in-se	-		6.
Mapping of Outcomes:		rse Out	comes	(COs)	to Pro	gram O	outcomes (P	OS) & Pi	rogram Spe	CIFIC
COs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	2	3	2	2	2	3	3
CO2	2	1	2	2	3	3	2	2	3	3
CO3	3	2	1	3	2	1	2	2	3	3
CO4	3	2	2	3	2	1	2	2	3	3
Average	2.75	1.75	2	2.5	2.5	1.75	2	2	3	3
Course C	Conter	nt:					1			
L (1	Hours/V	Week)		T (H	Iours/W	/eek)	P (Hours/	Week)	<b>Total Hou</b>	r/Week
	0				0		2		2	
Experime	ent No						Content			
1.									erstand; C4,	Analyze)
2.					ion of	soil (C1	,Remember	; C2,Unde	erstand;	
			,Analy							
3.									ub grade ma	terial
							; C3, Apply;			
4.			-		ngatior	ı, Flakin	ess Index &	Combin	ed Index (Ca	3,Apply;
			,Analy	,						
5.							3,Apply;C4,			
6.							(C4,Analyz			
7.							C4, Analyze		luate)	
8.		Str	riping v	value tes	st (C4,1	Analyze	; C5,Evalua	te)		



9.	Ductility test (C4, Analyze; C5, Evaluate)
10.	Penetration test (C4, Analyze; C5, Evaluate)
11.	Viscosity test (C4,Analyze; C5,Evaluate)

Teaching - Learning Strategies	Contact Hours	
Lecture		
Practical	24	
Seminar/Journal Club		
Small group discussion (SGD)	2	
Self-directed learning (SDL) / Tutorial		
Problem Based Learning (PBL)		
Case/Project Based Learning (CBL)	4	
Revision		
Others If any:		
Total Number of Contact Hours	30	

Formative	Summative
Viva-voce	Practical Examination & Viva-voce
Objective Structured Practical Examination	Objective Structured Practical Examination



### Mapping of Assessment with COs

Nature of Assessment	CO1	CO2	CO3	CO4	
Quiz					
VIVA	✓	✓	<ul> <li>✓</li> </ul>	✓	
Assignment / Presentation					
Unit test					
Practical Log Book/ Record Book	✓	✓	~	✓	
Demonstration	✓	✓	~	✓	
Mid Semester Examination 1					
Mid Semester Examination 2					
University Examination(External Practical)	✓	✓	~	✓	
				•	
Feedback Process	1. Student's Feedback				
Students Feedback is taken through various s	teps				
1. Regular feedback through Mentor Me	entee syst	em			
2. Feedback between the semester throu	gh Goog	le forms			



Faculty of Engineering & Technology											
Name of th	ie Dep	artmen	rtment Civil Engineering								
Name of th	ne Prog	gram		Ma	ster of	Techno	ology in Civi	l Engir	neering		
		-		(Tr	anspor	tation <b>E</b>	Engineering)				
Course Co	de			131	60137						
Course Tit	tle			Ge	ometri	c Desig	gn Lab				
Academic	Year			Ι							
Semester				Ι							
Number of	f Credi	its		1							
Course Pro	erequi	site		NII							
Course Sy	nopsis			Civ	ril 3D	/Open	Roads so	ftware	for road h	ighway	
	-			geo	metric	design					
Course Ou	tooma	<b>G</b> •									
At the end			student	s will be	able t	0.					
CO1				ous desig			r tools				
CO1						Ľ	le format				
CO3			1				on to align the	e profil	e		
CO4				0			plicable stan	-	-		
Mapping o				<b>-</b>	-	<b>_</b>	*		<b>Program Spe</b>	cific	
Outcomes:		-	_					_		_	
COs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO	PSO3	PSO4	
CO1	3	2	3	2	3	2	2	2	3	3	
CO1 CO2	3 2	2 1	3 2	2	3	2 3	2	2 2	33	3 3	
	2 3			2 3	3 2		2 2				
CO2 CO3 CO4	2 3 3	1 2 2	2 1 2	2 3 3	3 2 2	3 1 1	2 2 2 2	2 2 2	3 3 3	3 3 3	
CO2 CO3	2 3	1 2	2 1	2 3	3 2	3 1	2 2	2 2	33	3 3	
CO2 CO3 CO4 Average	2 3 3 2.75	1 2 2 1.75	2 1 2	2 3 3	3 2 2	3 1 1	2 2 2 2	2 2 2	3 3 3	3 3 3	
CO2 CO3 CO4 Average Course C	2 3 3 2.75	1 2 1.75	2 1 2	2 3 3 2.5	3 2 2 2.5	3 1 1 1.75	2 2 2 2	2 2 2 2	3 3 3 3	3 3 3 3	
CO2 CO3 CO4 Average Course C	2 3 3 2.75	1 2 1.75	2 1 2	2 3 3 2.5	3 2 2 2.5	3 1 1 1.75	2 2 2 2 2 P (Hours/W	2 2 2 2	3 3 3 3 Total Hour/	3 3 3 3	
CO2 CO3 CO4 Average Course C	2 3 3 2.75 Contei Hours/V 0	1 2 1.75 nt: Week)	2 1 2	2 3 3 2.5	3 2 2 2.5	3 1 1 1.75	2 2 2 2	2 2 2 2	3 3 3 3	3 3 3 3	
CO2 CO3 CO4 Average Course C L ()	2 3 3 2.75 Contei Hours/V 0	1 2 1.75 nt: Week)	2 1 2 2	2 3 3 2.5 T (He	3 2 2 2.5 0 0	3 1 1.75 eek)	2 2 2 2 P (Hours/W 2 Content	2 2 2 2	3 3 3 3 Total Hour/	3 3 3 3 Week	
CO2 CO3 CO4 Average Course C L (1 Experime 1. 2.	2 3 3 2.75 Contei Hours/V 0	1 2 1.75 nt: Week)	2 1 2 2	2 3 3 2.5 T (He	3 2 2.5 0urs/Wo 0	3 1 1.75 eek)	2 2 2 2 P (Hours/W 2 Content	2 2 2 2 (eek)	3 3 3 3 Total Hour/ 2	3 3 3 3 Week	
CO2 CO3 CO4 Average Course C L (1 Experime 1.	2 3 3 2.75 Contei Hours/V 0	1 2 1.75 nt: Week) Ba Su	2 1 2 2 sic cor	2 3 3 2.5 T (He	3 2 2 2.5 ours/Wo 0 nd view valida	3 1 1.75 eek)	2 2 2 2 2 P (Hours/W 2 Content cl (C1,Remen	2 2 2 2 (eek) mber; ( Analyz	3 3 3 3 Total Hour/ 2 C2,Understand) ze)	3 3 3 3 Week	
CO2 CO3 CO4 Average Course C L (1 Experime 1. 2. 3. 4	2 3 3 2.75 Contei Hours/V 0	1 2 1.75 nt: Week)	2 1 2 2 sic cor rvey in ring nat	2 3 3 2.5 T (Hencepts ar put and me and of hecker,	3 2 2 2.5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	3 1 1.75 eek) v contro tion (C g style creation	2 2 2 2 2 P (Hours/W 2 Content bl (C1,Rement bl (C1,Rement bl (C1,Rement 3,Apply; C4, (C3,Apply;	2 2 2 2 (eek) mber; ( Analyz C4,Ana (C5, E	3 3 3 3 Total Hour/ 2 C2,Understand) ze) dyze) cvaluate)	3 3 3 3 Week	
CO2 CO3 CO4 Average Course C L (1 Experime 1. 2. 3. 4 5	2 3 3 2.75 Contei Hours/V 0	1 2 1.75 nt: Week)	2 1 2 2 sic cor rvey in ring nat	2 3 3 2.5 T (Hencepts ar put and me and of hecker,	3 2 2 2.5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	3 1 1.75 eek) v contro tion (C g style creation	2 2 2 2 P (Hours/W 2 Content ol (C1,Remen 3,Apply; C4, (C3,Apply; C4,	2 2 2 2 (eek) mber; ( Analyz C4,Ana (C5, E	3 3 3 3 Total Hour/ 2 C2,Understand) ze) dyze) cvaluate)	3 3 3 3 Week	
CO2 CO3 CO4 Average Course C L (1) Experime 1. 2. 3. 4 5 6	2 3 3 2.75 Contei Hours/V 0	1 2 1.75 nt: Week)	2 1 2 2 sic cor rvey in ring nat rface c rface a ignmer	2 3 3 2.5 T (He neepts ar put and me and of hecker, nalysis a nt creation	3 2 2 2.5 0urs/We 0 nd view valida drawin string of and ear on (hor	3 1 1.75 eek) v contro tion (C g style creation th wor izontal	2 2 2 2 2 P (Hours/W 2 Content ol (C1,Remen 3,Apply; C4, (C3,Apply; C4, (C3,Apply	2 2 2 2 (eek) mber; ( Analyz C4,Ana (C5, E (C5, E curve)	3 3 3 3 Total Hour/ 2 C2,Understand) ze) dlyze) Evaluate)	3 3 3 3 Week	
CO2 CO3 CO4 Average Course C L (1 Experime 1. 2. 3. 4 5	2 3 3 2.75 Contei Hours/V 0	1 2 1.75 nt: Week) Ba Su Su Su Su Su Su Su Al Ca	2 1 2 2 sic corr rvey in ring nat rface c rface a ignmen rriagev	2 3 3 2.5 T (He neepts ar put and me and of hecker, nalysis a nt creation	3 2 2 2.5 ours/Wo 0 nd view valida drawin string o and ear on (hor gn (C5	3 1 1.75 eek) v contro tion (C g style creation th wor rizontal o,Evalu	2 2 2 2 2 P (Hours/W 2 Content ol (C1,Remen 3,Apply; C4, (C3,Apply; C4, (C3,Apply	2 2 2 2 (eek) mber; ( Analyz C4,Ana (C5, E (C5, E curve)	3 3 3 3 Total Hour/ 2 C2,Understand) ze) dlyze) Evaluate)	3 3 3 3 Week	



Teaching - Learning Strategies	Contact Hours
Lecture	
Practical	22
Seminar/Journal Club	
Small group discussion (SGD)	
Self-directed learning (SDL) / Tutorial	
Problem Based Learning (PBL)	4
Case/Project Based Learning (CBL)	4
Revision	
Others If any:	
Total Number of Contact Hours	30

### **Assessment Methods:**

Formative	Summative
Viva-voce	Practical Examination & Viva-voce
Objective Structured Practical Examination	Objective Structured Practical Examination
Problem Based Learning (PBL)	

### Mapping of Assessment with COs

Nature of Assessment	CO1	CO2	CO3	CO4
Quiz				
VIVA	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓
Assignment / Presentation				
Unit test				
Practical Log Book/ Record Book	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓
Demonstration	✓	<b>√</b>	<ul> <li>✓</li> </ul>	✓
Mid Semester Examination 1				
Mid Semester Examination 2				
University Examination(External Practical)	<ul> <li>✓</li> </ul>	✓	•	$\checkmark$
Feedback Process	1.	Student'	s Feedba	ck
Students Feedback is taken through various s	steps			
1 Regular feedback through Mentor Mentee	•			
2. Feedback between the semester through G	oogle for	ms		



# Master of Technology in Civil Engineering (Structural Engineering) 1<sup>st</sup> Semester



		]	Facult	y of Er	ngineerii	ng & T	echnolog	y			
Name of the	Depart			Civil Engineering							
Name of the				Master of Technology in Civil Engineering (Structural							
	0				neering)	C		U	U V		
Course Code	5			)	0114						
<b>Course Title</b>				Adva	anced Pr	re-stres	sed Con	crete St	ructure	es	
Academic Y	ear			Ι							
Semester				Ι							
Number of C	Credits			3							
<b>Course Prer</b>		e		Desig	gn of cor	ncrete st	ructure				
Course Syno	-							11 1.0.000	alaant	Due stueses d	
	<b>L</b>					,				Pre-stressed	
							0			ods and its	
				appli	cation.	Differe	nt types	of lo	sses in	pre-stressed	
					rete struc	cture an	d design.				
<b>Course Outc</b>	comes:										
At the end of	the cou	irse stuc	lents v	vill be a	able to:						
CO1	Knov	v the co	he concepts, methods and materials of pre-stressing systems.								
CO2					oncrete m		_				
CO3	,						oncrete n	nembers			
CO4					1		e-stresse			nbers.	
Mapping of Outcomes: COs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	
COS	101	102	105	104	105	100	1501	1502	1505	1504	
CO1	-	-	3	3	3	3	3	3	3	3	
CO2	-	-	3	3	3	3	-	-	-	-	
CO3	-	-	3	3	3	3	3	3	3	3	
CO4	-	-	3	3	3	3	3	3	3	3	
•			3	3	3	3	3	3	3	3	
Average	-	-	5	5	•	Č	C	5	5	C	
	- 	-	5	5	0			5	5		
Course Co						<u> </u>					
Course Co	ours/Wee				urs/Week)	<u> </u>	(Hours/V			Hour/Week	
Course Co L (Ho						P	(Hours/V 0				
Course Co L (Ho Unit	ours/Wee	ek)		T (Hou	urs/Week) 0	P Co	(Hours/V 0 ontent	Veek)	Total	Hour/Week 3	
Course Co L (Ho	ours/Wee	ek)	rentiat	T (Hou	urs/Week) 0 prced an	P Co d pre-st	(Hours/V 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Veek)	Total	Hour/Week 3 nalyze), State	
Course Co L (Ho Unit	ours/Wee	<b>bk</b> ) Differ the pr	rentiat	T (Hou e reinfo es of pr	urs/Week) 0 prced an e-stressi	P Co d pre-st ng (C1,	(Hours/V 0 ontent tressed co Rememb	Veek) oncrete ber), Me	<b>Total</b> (C4, A ethods a	Hour/Week 3 nalyze), State nd systems of	
Course Co L (Ho Unit	ours/Wee	ek) Differ the pr pre-st	rentiate	<b>T</b> (Hou e reinfo es of pr g – P	rs/Week) 0 prced an e-stressi rinciples	P Co d pre-st ng (C1, s of pr	(Hours/V 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Veek) oncrete per), Me ng – (	Total (C4, A ethods a Classify	Hour/Week 3 nalyze), State	





	and High strength steel, Stress-strain diagram (C2, Understand),									
	Examine Losses in pre-stress (C4, Analyze)									
2.	Describe Section Modulus and pre stressing force (C2, Understand),									
	Design of prismatic pre-stressed concrete members for bending at									
	service load (C6, Create), Design recommendation, Design of pre									
	tensioned and post tensioned flexural members (C6, Create)									
3.	Identify the Factors affecting deflection (C2, Understand), Compare									
	Short term and long term deflection of Cracked and Un-cracked									
	member (C4, Analyze), Demonstrate the Simple cable profiles and									
	Calculation of deflections (C3, Apply), Design of beams for shear and									
	torsion at working and ultimate loads (C6, Create)									
4.	Stress distribution, Anchorage zone stress, Anchorage zone									
	reinforcement, Design of Anchorage zone by Guyon's method -									
	Concept of Magnel's method – IS: 1343 recommendations.									

Teaching - Learning Strategies	Contact Hours
Lecture	20
Practical	
Seminar/Journal Club	3
Small group discussion (SGD)	3
Self-directed learning (SDL) / Tutorial	12
Problem Based Learning (PBL)	3
Case/Project Based Learning (CBL)	
Revision	4
Others If any:	
Total Number of Contact Hours	45

#### **Assessment Methods:**

Formative	Summative
Multiple Choice Questions (MCQ)	Mid Semester Examination 1
Viva-voce	Mid Semester Examination 2
Objective Structured Practical Examination	University Examination
Quiz	Dissertation
Seminars	Multiple Choice Questions (MCQ)
Problem Based Learning (PBL)	Short Answer Questions (SAQ)
Journal Club	Long Answer Question (LAQ)
	Practical Examination & Viva-voce
	Objective Structured Practical Examination

Nature of Assessment	CO1	CO2	CO3	CO4	



Quiz							
VIVA							
Assignment / Pres	entation	✓	<ul> <li>✓</li> </ul>	✓	<ul> <li>✓</li> </ul>		
Unit test		✓	<ul> <li>✓</li> </ul>	✓	✓		
Practical Log Boo							
Mid Semester Exa	✓	<ul> <li>✓</li> </ul>	✓	✓			
Mid Semester Exa	✓	✓	<ul> <li>✓</li> </ul>	✓			
University Examin	✓	✓	✓	✓			
1. Regular fe	s c is taken through variou edback through Mentor between the semester th	us steps Mentee s					
<b>References:</b>							
	Text Books1. Krishna Raju.N, (2Second Edition, CBSReference Books1. Dayarathnam PEdition, Oxford2. Sinha N. C andThird Edition, S	Publisher , (1996) & IBH – Roy S. 1	rs, ISBN- , Pre-stro Pubs Cor K., Funda	13: 9788 essed C npany, Is umentals	oncrete SBN-13: of Pre-st	54. Structure 9788120 ressed C	s, Fifth 400450.



		I	Faculty	v of En	igineei	ring &	z Techn	ology			
Name of the	Depart			Civil Engineering							
Name of the	-			Master of Technology in Civil Engineering (Structural							
				Engineering)							
<b>Course Code</b>				1316		5/					
Course Title					ctural	Dynai	mics				
Academic Year				I	cturur	Dyna	mes				
Semester				I							
Number of Credits				3							
Course Prerequisite				-							
					nology			<b>C C</b>			
Course Syno	psis									ystem (SDOF	
					, ,					ic and Impulse	
										ulti degree of	
				Ireed	om sys	stem (I	VIDUF (	Continuou	is Syster	ns).	
Course Outco											
	of the course students will be able to: Solve the problems on single degree of freedom system.										
CO1		-		<u> </u>	<u> </u>						
CO2				_			-	-	-	related analysis.	
CO3				-		-		dom syster	n.		
CO4	Evalu	ate the	mode	shapes	for dif	ferent	structur	es.			
Mapping of C Outcomes: COs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	
	101	102	105	104	105	100	1501	1502	1505	1504	
CO1	-	-	3	3	3	3	3	3	3	3	
CO2	-	-	3	3	3	3	-	-	-	-	
CO3	-	-	3	3	3	3	3	3	3	3	
CO4	-	-	3	3	3	3	3	3	3	3	
Average	-	-	3	3	3	3	3	3	3	3	
Course Con									1		
L (Ho	urs/Wee	<b>k</b> )		T (Hou		k)		rs/Week)	Tota	l Hour/Week	
	3	1			0			0		3	
Unit						onten					
1	1 Define Single Degree of Freedom System and free vibration (C Remember), State Alembert's principle (C1, Remember), Deriv Mathematical models for SDOF system (Analyze), Differentiat Damped and un-damped, Critical damping (C4, Analyze)					mber), Derive , Differentiate					
2 Interpret Rea				alysis	of un-	damp		-	-	Loading (C3, stem - general	

3 Develop Mathematical models of multi-degree-of-freedom systems (C6,



	Create), Define Shear building concept (C1, Remember), Discuss and examine free vibration of un-damped multi-degree-of- freedom systems – Natural frequencies and mode shapes, Orthogonality of modes (C2, Understand, C4, Analyze), Differentiate Vibration Analysis - Rayleigh's method - Approximate Analysis - Improved Rayleigh method C4, Analyze)
4	Investigate the Response of Shear buildings for harmonic loading without damping using normal mode approach (C6, Create), Investigate the Response of Shear buildings for forced vibration for harmonic loading with damping using normal mode approach (C6, Create)

Teaching - Learning Strategies	Contact Hours
Lecture	18
Practical	
Seminar/Journal Club	
Small group discussion (SGD)	
Self-directed learning (SDL) / Tutorial	14
Problem Based Learning (PBL)	8
Case/Project Based Learning (CBL)	
Revision	05
Others If any:	
Total Number of Contact Hours	45

## **Assessment Methods:**

Formative	Summative
Multiple Choice Questions (MCQ)	Mid Semester Examination 1
Viva-voce	Mid Semester Examination 2
Objective Structured Practical Examination	University Examination
Quiz	Dissertation
Seminars	Multiple Choice Questions (MCQ)
Problem Based Learning (PBL)	Short Answer Questions (SAQ)
Journal Club	Long Answer Question (LAQ)
	Practical Examination & Viva-voce
	Objective Structured Practical Examination

Nature of Assessment	CO1	CO2	CO3	CO4	
Quiz					
VIVA					





Assignment / Prese	entation	✓	✓	✓	✓				
Unit test		<ul> <li>✓</li> </ul>	✓	✓	✓				
Practical Log Book									
Mid Semester Exam	mination 1	<ul> <li>✓</li> </ul>	✓	<ul> <li>✓</li> </ul>	✓				
Mid Semester Exam	mination 2	✓	✓	<ul> <li>✓</li> </ul>	✓				
University Examin	ation	<ul> <li>✓</li> </ul>	✓	✓	<ul> <li>✓</li> </ul>				
						I			
Feedback Process	l	2. Student's Feedback							
1. Regular fee	is taken through various dback through Mentor M etween the semester thro	lentee s	•	S					
	Text Books 1. Mario Paz, (2004), S Second Edition, CBS F Reference Books 1. J. Humar, (2012), D ISBN- 13: 9780415620 2. Anil K. Chopra, (200 Applications to Earthqu ISBN-13: 9788131713	Publishe ynamics )864. )3), Dyr uake H	rs, ISBN-	13: 9788 tures, Thi	123909783 ard Edition, es - Theory	CRC Press,			



Faculty of Engineering & Technology										
Name of the	Civil Engineering									
				Master of Technology in Civil Engineering (Structural						
_					eering)		8,			
Course Code	Course Code				116					
Course Title						ods of	f Struct	ural Ana	alvsis	
Academic Y				I	A MICH	ous o	Siluci	ur ar 1 xiic	11y 515	
Semester				I						
Number of Credits				3						
Course Prer		<u>د</u>		-	ural Ana	alvsis				
Course Syno	•						nlv dea	ls with	matrix	analysis of
	Polo						•			ic concepts of
						-				-
						•		•		nows how the
					-					amework for
								-		criptions, and
				demon	istration	is three	ough m	any exai	nples, of	f how matrix
				metho	ds can b	be app	olied to	linear sta	tic analy	sis of skeletal
				structures (plane and space trusses; beams and grids; plane						
				and space frames) by the stiffness method, and also the						
				flexibility method.						
Course Outc	omos.									
At the end of		irse stud	lents w	ill be ab	le to					
CO1						v matr	ix metho	d and stif	fness mati	ix method
CO2				ures by flexibility matrix method and stiffness matrix method. e space trusses and space frames.						
CO3			-	of settlement of supports.						
Mapping of								(POs) &	Program	n Specific
Outcomes:	course	Outco	ines (C	03) 101	liugiai	in Ou	comes	$(\mathbf{I} \mathbf{O} \mathbf{S}) \mathbf{a}$	Tiograi	n speeme
COs	PO1	PO2	PO3	PO4	PO5	PO	PSO1	PSO2	PSO3	PSO4
<u> </u>			2	2	2	6	2	2	2	2
CO1 CO2	-	-	3 3	3 3	3 3	3 3	3	3	3	3
CO2 CO3	-	-	<u> </u>	3	3	$\frac{3}{3}$	- 3	3	3	- 3
05	-	•	_	_	-	_	-	_	_	
Average	-	-	3	3	3	3	3	3	3	3
0 0										
Course Co				<b>T</b>			<b>D</b>			
L (Ho	ours/Wee	ek)		T (Hours			P (Hours	/Week)	Total	Hour/Week
	3	1		0			0			3
Unit							<u>Content</u>			
1 Define stat				c inde	termina	cy a	and ki	nematic	indeteri	minacy (C1,



	Remember), Differentiate between static indeterminacy and kinematic indeterminacy (C2, Understand; C4, Analyze), Compare flexibility matrix and stiffness matrix (C4, Analyze), Discuss the properties of matrices (C2, Understand), - explain coordinate system (C2, Understand), Analyze the beam (C4, Analyze), Formulate and derivation of stiffness matrix of beam element from strain energy (C6, Create)
2	Formulate Displacement transformation matrix (C6, Create), explain global stiffness matrix (C2, Understand), analysis of continuous beams (C4, Analyze), analysis of rigid frames and trusses (C4, Analyze).
3	Analysis of continuous beam (C4, Analyze), Compare and analyze the plane truss and plane frame by stiffness matrix method ((C2, Understand; C4, Analyze), Investigate the Internal forces due to thermal expansion and lack of fit (C6, Create), discuss the effect of settlement of supports (C2, Understand).
4	Use, analyze and investigate the bar, truss, beam, and frame structures of determinate and indeterminate ones using direct stiffness method (C3, Apply; C4, Analyze; C6, Create)

Teaching - Learning Strategies	Contact Hours	
Lecture	18	
Practical		
Seminar/Journal Club		
Small group discussion (SGD)		
Self-directed learning (SDL) / Tutorial	15	
Problem Based Learning (PBL)	8	
Case/Project Based Learning (CBL)	-	
Revision	4	
Others If any:		
Total Number of Contact Hours	45	

#### **Assessment Methods:**

Formative	Summative
Multiple Choice Questions (MCQ)	Mid Semester Examination 1
Viva-voce	Mid Semester Examination 2
Objective Structured Practical Examination	University Examination
Quiz	Dissertation
Seminars	Multiple Choice Questions (MCQ)
Problem Based Learning (PBL)	Short Answer Questions (SAQ)



Journal Club	Long Answer Question (LAQ)
	Practical Examination & Viva-voce
	Objective Structured Practical Examination

Nature of Assessm	CO1	CO2	CO3				
Quiz							
VIVA							
Assignment / Prese	✓	<ul> <li>✓</li> </ul>	✓				
Unit test		✓	<ul> <li>✓</li> </ul>	✓			
Practical Log Bool	k/ Record Book						
Mid Semester Exam	mination 1	✓	<ul> <li>✓</li> </ul>	✓			
Mid Semester Exam	<ul> <li>✓</li> </ul>	✓	✓				
University Examin	✓	<ul> <li>✓</li> </ul>	✓				
Feedback Process	\$	1.	Student'	s Feedbac	k		
Students Feedback	is taken through various	steps					
Ū.	k through Mentor Mentee on the semester through C	•	rms				
References:							
	<b>Text Books</b> 1. Pundit G.S. & Gupta S.P., (2008), Structural Analysis (A matrix						
	approach), Second Edition, Tata McGraw Hill Education, ISBN-13: 9780070667358.						
	Reference Books						
	1 J. S. Przemieniecki, (	1985), Tl	neory of N	Aatrix Str	uctural	Analysis	, New
	Edition, Dover Publicat		•			2	
	2. Richard B. Nelson, L	,				ctural A	nalysis,
	John Wiley & Sons, Im	ported E	dition, IS	BN-13: 9	780471	123248.	-



Name of the	Donord		raculty				<b>Fechnolo</b>	ygy		
	-					eering	au in Ci-	vil Engin	oning (	Cturral
Name of the	rogra	m					gy in Civ	/11 Engine	eering (	Structural
<u> </u>					neering	g)				
Course Cod	-			1316		~ .	<u>a</u>			
Course Title	-			Desi	gn of (	Concret	e Structu	iral Syst	ems	
Academic Y	ear			Ι						
Semester				Ι						
Number of				3						
<b>Course Pren</b>	equisite	9		Desig	gn of c	oncrete	structure			
Course Syn	opsis			Limi	t state	design n	nethod, I	Deep Bear	ms, Flat	Slab,
				Colu	mns ar	nd shear	walls and	d framed	building	gs
<b>Course Out</b>	comes:			1						-
At the end of		rse stud	lents w	vill be a	able to					
CO1	1						1			
CO2		Analysis of beam using limit state design         Analyze and design the deep beams and flat slab								
CO3	-	line the	-	r						
CO4				olumn	and	stair cas	0			
	-								D	<b>0</b> • <b>0</b>
Mapping of	Course	Outco	mes (C	US) to	Prog	ram Ou	tcomes (	PUS) & I	Prograi	m Specific
<b>Outcomes:</b>										
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
COs										
COs				1 -	2	3	1	-	3	3
COs CO1	1	-	3	3	3	3			•	•
	1 1	-	3 3	3 3	3	3 3	1	-	3	3
<b>CO1</b>		- - -			-			-		
CO1 CO2	1	-	3	3	3	3	1	- - -	3	3

Course Content.							
L (Hours/Wee	k)	T (Hours/Week)	P (Hours/Week)	<b>Total Hour/Week</b>			
3		0	0	3			
Unit	Content						
1	Define an	nd explain Limit stat	e analysis and desig	in of beams in flexure			
	(C1, Remember; C2, Understand), Demonstrate the Behavior of						
	reinforced concrete members in bending (C3, Apply), Discuss the						
	Plastic hinge and Rotation capacity (C2, Understand), explain factors						
	affecting rotation capacity of a section and Plastic moment (C2,						
	Understand), Demonstrate and formulate the Moment curvature						
	relationship and Redistribution of moments (C4, Analyze; C6, Create)						
2	Define an	nd Design Steps of D	eep Beams as per IS	5 456 (C1, Remember;			



	C6, Create), Investigate the Detailing of Deep Beams and Checking for
	Local Failures (C2, Understand; C6, Create)
	Direct design method -Discuss and investigate the distribution of
	moments in column strips and middle strip moment and shear transfer
	from slabs to columns using direct design method (C2, Understand; C6,
	Create), Design for Shear in Flat slabs-Check for one way and two way
	shears (C6, Create), Describe Equivalent frame method and Direct
	design method (C2, Understand), Compare the distribution of moments
	in column strips and middle strip sketch showing reinforcement details
	(C4, Analyze).
3	Describe yield line analysis for slabs (C2, Understand), Differentiate
	Virtual work and equilibrium methods of analysis – For square circular,
	Rectangular, Triangular and Hexagonal with simple and continuous end
	conditions along with Reinforcement details (C4, Analyze).
4	Describe column and Euler theory (C2, Understand), Differentiate the
	different methods of design of Slender Columns (C4, Analyze), Design
	of slender column subjected to combined bending moment & axial force
	using SP: 16 (C6, Create).
	Explain staircase (C2, Understand), Compare the different types of
	staircases (C4, Analyze), Design of staircase as per IS code (C6, Create)

Teaching - Learning Strategies	Contact Hours	
Lecture	25	
Practical		
Seminar/Journal Club		
Small group discussion (SGD)		
Self-directed learning (SDL) / Tutorial	10	
Problem Based Learning (PBL)	6	
Case/Project Based Learning (CBL)		
Revision	04	
Others If any:		
Total Number of Contact Hours	45	

#### **Assessment Methods:**

Formative	Summative
Multiple Choice Questions (MCQ)	Mid Semester Examination 1
Viva-voce	Mid Semester Examination 2
Objective Structured Practical Examination	University Examination
Quiz	Dissertation



Seminars	Multiple Choice Questions (MCQ)
Problem Based Learning (PBL)	Short Answer Questions (SAQ)
Journal Club	Long Answer Question (LAQ)
	Practical Examination & Viva-voce
	Objective Structured Practical Examination

Nature of Assessm	CO4								
Quiz									
VIVA									
Assignment / Prese	entation	✓	<ul> <li>✓</li> </ul>	✓         ✓					
Unit test		✓	<ul> <li>✓</li> </ul>	✓	✓ ✓ ✓				
Practical Log Bool	k/ Record Book								
Mid Semester Exa	mination 1	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓				
Mid Semester Exa	mination 2	✓	<ul> <li>✓</li> </ul>	✓	✓				
University Examin	ation	✓	<ul> <li>✓</li> </ul>	✓	✓				
Feedback Process	5	2. Stu	ident's Fe	edback					
3. Regular fee	t is taken through various edback through Mentor Mo between the semester thro <b>Text Books</b> 1. Krishnaraju N., (2)	lentee sys ugh Goo	gle forms		rced Cor	acrete Desi	ign.		
	Second Edition, CB						, 5,		
	<b>Reference Books</b>								
	<ol> <li>Reference books</li> <li>P. C. Varghese, (2009), Advanced Reinforced Concrete Desig Second Edition, Phi Learning Pvt. Ltd., ISBN-13: 9788120327870.</li> <li>M. L. Gambhir, (2009), Design of Reinforced Concrete Structure First Edition, Phi Learning Pvt. Ltd., ISBN-13: 9788120331938.</li> </ol>								
	<ol> <li>P. Dayaratnam, (2) Fourth Edition, C 9788120414198.</li> <li>B. C. Punmia, As</li> </ol>	Oxford	& IBH	– Pubs	Compa	ny, ISBN-	13:		
	Designs, Laxmi Put						C.		



		]	Facu	lty of Eı	nginee	ring 8	k Technol	logy			
Name of the		Civil Engineering									
Name of the				Master of Technology in Civil Engineering (Structural							
8					neering		05	L L	0 0	<b>`</b>	
<b>Course Code</b>				0	0118						
<b>Course Title</b>						thods	of Struct	ural A	nalysis La	ab	
Academic Ye	ar			Ι							
Semester				Ι							
Number of C	redits			3							
<b>Course Prere</b>	quisite	9		Struc	ctural A	Analys	is				
Course Syno	-			This				als wit	h matrix	analysis of	
•	•			struc			•			sic concepts of	
						-				shows how the	
						•		-		framework for	
					-						
								•		scriptions, and	
							•	•	-	of how matrix	
									•	sis of skeletal	
				struc	tures (	plane	and space	trusses	; beams an	nd grids; plane	
				and	and space frames) by the stiffness method, and also the						
				flexi	flexibility method.						
Course Outco	omes:										
At the end of	the cou	rse stuc	lents	will be a	able to	:					
CO1	Solve	differe	ent s	structure	ctures by flexibility matrix method and stiffness matrix						
	metho	od.			-		-				
CO2	Visua	lize and	1 ana	lvze spa	ce trus	ses an	d space fr	ames.			
<u>CO3</u>				· ·			supports.	unicsi			
Mapping of (							11	(POs)	& Progra	m Specific	
Outcomes:	course	Outco	ines .	(005) u	,1105		Jutcomes	$(\mathbf{I} \mathbf{O} \mathbf{S})$	a 11051u	in Speenie	
COs	PO1	PO2	PO3	3 PO4	PO5	PO	6 PSO1	PSO2	PSO3	PSO4	
CO1	-	-	3	3	3	3	3	3	3	3	
CO2	-	-	3	3	3	3	-	-	-	-	
CO3	-	-	3	3	3	3	3	3	3	3	
Average	-	-	3	3	3	3	3	3	3	3	
	1			_	_		-	-	-		
Course Co	ntent:										
L (Ho	urs/Wee	ek)		T (Hou	Γ (Hours/Week) P (Hou			/Week)	Total	Hour/Week	
	0				0		2			2	
Experiment	t No.						Content				
1.		Analy	vsis o	of proppe	ed cant	ilever	beam (C4	, Analy	ze)		
2.		~		1	two span continuous beams(C4, Analyze)						
3. Analysis of s				of statical	lly dete	ermina	te plane t	$russ(\overline{C4}$	, Analyze	.)	



4.	Analysis of statically indeterminate plane truss(C4, Analyze)
5.	Analysis of kinematically indeterminate plane truss(C4, Analyze)
6.	Analysis of one bay – one storey plane frame(C4, Analyze)
7.	Analysis of multi bay – multi storied plane frame(C4, Analyze)
8.	Analysis of space truss(C4, Analyze)
9.	Analysis of space frame(C4, Analyze)

Teaching - Learning Strategies	Contact Hours
Lecture	
Practical	13
Seminar/Journal Club	
Small group discussion (SGD)	04
Self-directed learning (SDL) / Tutorial	
Problem Based Learning (PBL)	13
Case/Project Based Learning (CBL)	
Revision	
Others If any:	
Total Number of Contact Hours	30

#### **Assessment Methods:**

Formative	Summative
Multiple Choice Questions (MCQ)	Mid Semester Examination 1
Viva-voce	Mid Semester Examination 2
Objective Structured Practical Examination	University Examination
Quiz	Dissertation
Seminars	Multiple Choice Questions (MCQ)
Problem Based Learning (PBL)	Short Answer Questions (SAQ)
Journal Club	Long Answer Question (LAQ)
	Practical Examination & Viva-voce
	Objective Structured Practical Examination

Nature of Assessment	CO1	CO2	CO3		
Quiz					
VIVA	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>		
Assignment / Presentation					
Unit test					
Practical Log Book/ Record Book	✓	<ul> <li>✓</li> </ul>	✓		
Mid Semester Examination 1					



Mid Semester Examination 2											
University Examination (External	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓								
Practical)											
Feedback Process	2. S	tudent's I	Feedback								
e	Students Feedback is taken through various steps         1. Regular feedback through Mentor Mentee system										
2. Feedback between the semester thro	•										



1		I	aculty	y of En	gineer	ing & T	Fechnolog	y				
Name of the Department					Civil Engineering							
Name of the Program					Master of Technology in Civil Engineering (Structural							
	0				neering		0.	C	U V			
<b>Course Code</b>				1316								
<b>Course Title</b>				Desig	n of C	oncret	e and Stru	ctural	Systems	Lab		
				-	AD PI							
Academic Ye	ar			I								
Semester				Ι								
Number of C	redits			2								
<b>Course Prere</b>	quisite			Desig	gn of C	oncrete	Structural	System	IS			
Course Syno	psis			Limit	state d	lesign n	nethod, Be	ams, Sl	ab, Colu	mns and		
	-			frame	ed build	dings &	design of	these by	using S	STAAD Pro.		
<b>Course Outco</b>	omes:											
At the end of t	the cou	rse stuc	lents w	vill be a	ble to:							
CO1	Analy	ze and d	lesign tl	he fram	e.							
CO2	Analy	ze and d	lesign tl	he bean	ns.							
CO3	Desig	n shear	s wall	buildin	igs and	slabs.						
CO4	Desig	n of sle	ender c	olumns	5.							
Mapping of C	Course	Outco	mes (C	COs) to	Progr	am Ou	tcomes (P	Os) & 1	Progran	n Specific		
<b>Outcomes:</b>												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4		
act.			2	2 2 2 1								
CO1	1	-	3	3	3	3	1	-	3	3		
CO1 CO2	1 1	-	<u> </u>	<u>3</u>	3 3	3	1 1	-	3 3	3		
					3 3	3 3		-		3 3		
CO2	1		3 3 3	3	3 3 3	3 3 3	1	- - -	3	3 3 3		
CO2 CO3	1 1		3 3	3 3	3 3	3 3	1 1	- - - -	3 3	3 3		
CO2 CO3 CO4	1 1 1	- - -	3 3 3	3 3 3	3 3 3	3 3 3	1 1 1	- - -	3 3 3	3 3 3		
CO2 CO3 CO4	1 1 1 1	- - -	3 3 3	3 3 3	3 3 3	3 3 3	1 1 1	- - - -	3 3 3	3 3 3		
CO2 CO3 CO4 Average Course Cor	1 1 1 1	-	3 3 3 3	3 3 3 3	3 3 3	3 3 3 3	1 1 1		3 3 3 3	3 3 3		
CO2 CO3 CO4 Average Course Cor	1 1 1 1	-	3 3 3 3	3 3 3 3 T (Hou	3 3 3 3	3 3 3 3	1 1 1 1		3 3 3 3	3 3 3 3		
CO2 CO3 CO4 Average Course Cor	11111ntent:urs/Wee0	-	3 3 3 3	3 3 3 3 T (Hou	3 3 3 3 rs/Week	3 3 3 3 x) 1	1 1 1 1		3 3 3 3	3 3 3 3 Hour/Week		
CO2 CO3 CO4 Average Course Cor L (Hou	11111ntent:urs/Wee0	- - - k)	3 3 3 3	3 3 3 T (Hou	3 3 3 3 rs/Weel 0	3 3 3 (x) 1 (C	1 1 1 1 2 (Hours/W 4	- - - -	3 3 3 3 Total I	3 3 3 3 Hour/Week		
CO2 CO3 CO4 Average Course Cor L (Hou Experiment	11111ntent:urs/Wee0	- - - k) Desig	3 3 3 3 n of pr	3 3 3 T (Hou	3 3 3 3 rs/Week 0 cantile	3 3 3 3 x) 1 ver RC0	1           1           1           1           2           (Hours/W)           4           Content	- - - - (eek) 6, Desig	3 3 3 Total I	3 3 3 3 Hour/Week		
CO2 CO3 CO4 Average Course Cor L (Hou Experiment 1.	11111ntent:urs/Wee0	- - k) Desig	3 3 3 n of pr n of tw	3 3 3 T (Hou	3 3 3 3 rs/Week 0 cantile	3 3 3 (x) 1 (ver RC0 (ver RC0)	1           1           1           1           2           (Hours/W           4           Content           C beam (C	- - - - 6, Desig (C6, De	3 3 3 3 Total I gn) essign)	3 3 3 3 Hour/Week 2		
CO2 CO3 CO4 Average Course Cor L (Hou Experiment 1. 2.	11111ntent:urs/Wee0	- - - k) Desig Desig Analy	3 3 3 n of pr n of tw vsis and	3 3 3 T (Hou ropped vo span	3 3 3 3 rs/Week 0 cantile contin n one b	3 3 3 (x) 1 (ver RC0 (ver RC0 (vous Re) (vay – on	1         1         1         1         1         P (Hours/W         4         Content         C beam (C         CC beams	- - - - 6, Desig (C6, De ane fran	3 3 3 3 Total I gn) esign) ne (C6,	3 3 3 Hour/Week 2 Design)		
CO2 CO3 CO4 Average Course Cor L (Hou Experiment 1. 2. 3.	11111ntent:urs/Wee0	- - - k) Desig Desig Analy	3 3 3 3 n of pr n of tw vsis and	3 3 3 T (Hou ropped vo span	3 3 3 3 rs/Week 0 cantile contin n one b	3 3 3 (x) 1 (ver RC0 (ver RC0 (vous Re) (vay – on	1       1       1       1       2       4       2       5       6       1       2       2       2       4       2       5       4       5       6       1       1       1       1       1       1       1       1       1       1       1       1       1       2       1 <t< th=""><th>- - - - 6, Desig (C6, De ane fran</th><th>3 3 3 3 Total I gn) esign) ne (C6,</th><th>3 3 3 Hour/Week 2 Design)</th></t<>	- - - - 6, Desig (C6, De ane fran	3 3 3 3 Total I gn) esign) ne (C6,	3 3 3 Hour/Week 2 Design)		
CO2 CO3 CO4 Average Course Cor L (Hou Experiment 1. 2. 3.	11111ntent:urs/Wee0	- - - k) Desig Desig Analy Desig	3 3 3 n of pr n of tw vsis and vsis and n)	3 3 3 T (Hou opped vo span d desig	3 3 3 3 rs/Weel 0 cantile contin n one b n of mu	$\begin{array}{c c} 3\\ \hline 3\\ \hline 3\\ \hline \\ \\ \hline \\ \\ \hline \\ \\ \hline \\ \\ \\ \hline \\ \\ \\ \\$	1       1       1       1       2       4       2       5       6       1       2       2       2       4       2       5       4       5       6       1       1       1       1       1       1       1       1       1       1       1       1       1       2       1 <t< th=""><th>- - - - 6, Desig (C6, De ane fran pried pla</th><th>3 3 3 3 Total I gn) esign) ne (C6,</th><th>3 3 3 Hour/Week 2 Design)</th></t<>	- - - - 6, Desig (C6, De ane fran pried pla	3 3 3 3 Total I gn) esign) ne (C6,	3 3 3 Hour/Week 2 Design)		



Teaching - Learning Strategies	Contact Hours	
Lecture		
Practical	15	
Seminar/Journal Club		
Small group discussion (SGD)		
Self-directed learning (SDL) / Tutorial		
Problem Based Learning (PBL)	4	
Case/Project Based Learning (CBL)	11	
Revision		
Others If any:		
Total Number of Contact Hours	30	

#### **Assessment Methods:**

Formative	Summative
Multiple Choice Questions (MCQ)	Mid Semester Examination 1
Viva-voce	Mid Semester Examination 2
Objective Structured Practical Examination	University Examination
Quiz	Dissertation
Seminars	Multiple Choice Questions (MCQ)
Problem Based Learning (PBL)	Short Answer Questions (SAQ)
Journal Club	Long Answer Question (LAQ)
	Practical Examination & Viva-voce
	Objective Structured Practical Examination

Nature of Assessment	CO1	CO2	CO3	CO4	
Quiz					
VIVA	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓	<ul> <li>✓</li> </ul>	
Assignment / Presentation					
Unit test					
Practical Log Book/ Record Book	✓	✓	✓	✓	
Demonstration	✓	✓	✓	<ul> <li>✓</li> </ul>	
Mid Semester Examination 1					
Mid Semester Examination 2					
University Examination (External	✓	<ul> <li>✓</li> </ul>	✓	✓	
Practical)					
riactical)					



#### Feedback Process

2. Student's Feedback

Students Feedback is taken through various steps

- 1. Regular feedback through Mentor Mentee system
- 2. Feedback between the semester through Google forms



# Master of Technology in Civil Engineering (Remote Sensing and GIS) 1<sup>st</sup> Semester



				Facu	lty of E	ngineer	ing & Te	chnology					
Name	of the	Depar	tment		Civil	Civil Engineering							
Name of the Program						er of Te GIS)	chnology	in Civil En	gineering	(Remote	Sensing		
Cours	se Code	e			1316	,							
Cours	se Title				Prin	ciples of	Remote	Sensing					
Acade	emic Ye	ear			Ι								
Semes	ster				Ι								
Numb	er of C	Credits			3								
Cours	e Prer	equisit	e		Stude	ents show	uld have t	basic knowl	ledge of su	urveying	and		
					conto	ours at u	ndergradu	ate level.					
Course Synopsis					To p	rovide th	ne student	s with data	acquisitic	on, proces	sing and		
					senso	ors, this o	can be use	ed in their r	respective	fields.			
	e Outc												
			urse stud						<u> </u>				
CO1	Select	the typ	pe of ren	note sen	sing da	ta for ma	apping ea	rth surface	features				
CO2	Analy	ze the	energy in	nteractio	ons with	the atm	osphere a	and earth su	irface feat	ures			
CO3	Identi	fy the e	earth sur	face feat	tures fro	om satel	lite image	es					
<b>CO4</b>	Apply	remot	e sensing	g technic	ques foi	r natural	resources	s evaluatior	1				
Mapp	ing of (	Course	e Outcor	nes (CC	Ds) to P	rogram	Outcom	es (POs) &	Progran	n Specifi	2		
Outco			DOA	DO2	DO 4	<b>DO</b> 5	<b>D</b> O(	DCO1	DCOA	DCO2	DCO 4		
COs		PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4		
CO1		3	2	-	-	-	-	-	-	1	1		
CO2		3	2	-	-	-	-	-	-	1	1		
CO3		3	2	-	-	-	-	-	-	1	1		
CO4		3	1	-	-	-	-	-	-	1	1		
Avera	ige 3	3	1.75	-	-	-	-	-	-	1	1		



ontent:								
T (Hours/Week)	Р	(	CL	Total Hour/Week				
	(Hours/Week)	(Hours	s/Week)					
-	-			3				
	Content and	Competer	ncy					
Sources of Energy (C	2, Understand), A	Active and	Passive 1	Radiation. (C2, Understand),				
Radiation - Reflectanc	e, Transmission, A	bsorption	ı (C3, App	lication), Thermal Emissions,				
Interaction with Atmo	sphere (C1, Reme	ember), A	tmospheric	c windows. (C1, Remember),				
Spectral reflectance of	of Earth's surface	features	(C3, Ap	plication), Multi concept of				
Remote Sensing. (C3,	Application)							
1. Various types of platforms C2 (Understand), different types of aircraft, manned and								
unmanned spacecrafts	used for data acqu	uisition (	C6, Creat	e), characteristics of different				
types of platforms (C	5, Evaluate), IRS	Satellite S	Sensors, L	ANDSAT, SPOT, IKONOS,				
Quickbird, Geoeye, H	Kompsat, Worldvi	ompsat, Worldview II & III, Microwave, ALOS, Planet Data,						
Sentinel, SMAP, MOI	DIS (C2, Understar	nd)						
Optical, thermal and	d microwave (C	2, Unde	rstand), I	Resolutions-spatial, spectral,				
radiometric and temp	ooral (C1, Remen	nber), sig	nal to no	oise ratio (C3, Application),				
LiDAR data acquisitio	n and processing.	(C1, Rem	ember)					
Explain the application	n the applications of Remote sensing in various Engineering and Science domains.							
C2 (Understand),	Explain the Agri	culture, I	Forest, So	il, Geology, LU/LC, Water				
Resources, Urban, Dis	aster Management	, etc. (C2,	Understan	nd)				
	- Sources of Energy (C Radiation - Reflectanc Interaction with Atmo Spectral reflectance of Remote Sensing. (C3, 1. Various types of pr unmanned spacecrafts types of platforms (C Quickbird, Geoeye, H Sentinel, SMAP, MOD Optical, thermal and radiometric and temp LiDAR data acquisitio Explain the application C2 (Understand),	T (Hours/Week)       P         (Hours/Week)       (Hours/Week)         -       -         Content and Q       Sources of Energy (C2, Understand), A         Radiation - Reflectance, Transmission, A         Interaction with Atmosphere (C1 , Remote Sensing. (C3, Application)         1. Various types of platforms C2 (Undumnanned spacecrafts used for data acquitypes of platforms (C5, Evaluate), IRS         Quickbird, Geoeye, Kompsat, Worldvir Sentinel, SMAP, MODIS (C2, Understand)         Optical, thermal and microwave (Cradiometric and temporal (C1, Remere LiDAR data acquisition and processing.         Explain the applications of Remote sensing.         C2 (Understand), Explain the Agrit	T (Hours/Week)       P       (Hours/Week)         -       -         -       -         Sources of Energy (C2, Understand), Active and Radiation - Reflectance, Transmission, Absorption Interaction with Atmosphere (C1 , Remember), A Spectral reflectance of Earth's surface features Remote Sensing. (C3, Application)         1. Various types of platforms C2 (Understand), of unmanned spacecrafts used for data acquisition (C1 types of platforms (C5, Evaluate), IRS Satellite S Quickbird, Geoeye, Kompsat, Worldview II & Sentinel, SMAP, MODIS (C2, Understand)         Optical, thermal and microwave (C2, Understand)         Optical, thermal and microwave (C2, Understand)         Coptical, thermal and microwave (C2, Understand)         Coptical, thermal and microwave (C2, Understand)         Coptical, thermal and microwave (C2, Understand)         C2 (Understand), Explain the Agriculture, Hermal	T (Hours/Week)       P       CL         (Hours/Week)       (Hours/Week)       (Hours/Week)         -       -       -         Sources of Energy (C2, Understand), Active and Passive Radiation - Reflectance, Transmission, Absorption (C3, App Interaction with Atmosphere (C1 , Remember), Atmospheric Spectral reflectance of Earth's surface features (C3, App Remote Sensing. (C3, Application)         1. Various types of platforms C2 (Understand), different ty unmanned spacecrafts used for data acquisition ( C6 , Creat types of platforms (C5, Evaluate), IRS Satellite Sensors, L Quickbird, Geoeye, Kompsat, Worldview II & III, Micro Sentinel, SMAP, MODIS (C2, Understand)         Optical, thermal and microwave (C2, Understand), I radiometric and temporal (C1, Remember), signal to not LiDAR data acquisition and processing. (C1, Remember)         Explain the applications of Remote sensing in various Engine				

# Learning Strategies and Contact Hours

Learning Strategies	Contact Hours
Lecture	32
Practical	
Seminar/Journal Club	2
Small group discussion (SGD)	2



Self-directed learning (SDL) / Tutorial	1
Problem Based Learning (PBL)	2
Case/Project Based Learning (CBL)	2
Revision	4
Others If any:	
Total Number of Contact Hours	45

# **Assessment Methods:**

Formative	Summative
Multiple Choice Questions (MCQ)	Mid Semester Examination 1
Quiz	Mid Semester Examination 2
Seminars	University Examination
Problem Based Learning (PBL)	Short Answer Questions (SAQ)
Journal Club	Long Answer Question (LAQ)

Nature of Assessn	nent	CO1	CO2	CO3	CO4		
Quiz	✓	✓	✓	✓			
Assignment / Prese	entation	✓	<ul> <li>✓</li> </ul>	✓	✓		
Unit test		✓	<ul> <li>✓</li> </ul>	✓	✓		
Mid Semester Exam	mination 1	✓	<ul> <li>✓</li> </ul>	✓	<ul> <li>✓</li> </ul>		
Mid Semester Exam	✓	<ul> <li>✓</li> </ul>	✓	<ul> <li>✓</li> </ul>			
University Examin	✓	<ul> <li>✓</li> </ul>	✓	<ul> <li>✓</li> </ul>			
				<b>I</b>			
Feedback Process		2. Stude	ent's Feedb	ack			
References:	Textbooks:						
	1. Introduction to Remote Sensing, James B. Campbell & Randolph H.						
	Wynne., The Guilford Press, 2011.						
	2. Introduction to the physics and techniques of Remote Sensing, Charles						



Elach & Jakob van Zyl., John Wiley & Sons publications, 2006.
3. Remote Sensing and Image Interpretation, Lilles and T.M & Kiefer
R.W., John Wiley and Sons, 2015
References:
1. Thermal microwave radiation: Applications for remote sensing, Chritian
Matzler., The institution of Engineering and Technology, London, 2006
2. Remote Sensing: Models and Methods for Image Processing, Schowengerdt,
R. A., Academic Press, 2007.
3. Introduction to Remote Sensing, Cracknell, A.P., Second Edition, Tylor &
Francis, London, 1991.



Faculty of Engineering & Technology												
Name	of th	e Departm	ent	Civil Engineering								
Name	e of th	e Program			Master of Technology in Civil Engineering (Remote Sensing and GIS)							
Cours	se Coo	le		131	13160108							
Cours	se Titl	e		Geo	ographi	ical Inform	nation Sy	stems				
Acade	emic Y	lear		Ι								
Seme	ster			Ι								
Numb	per of	Credits		3								
Cours	se Pre	requisite		NIL	_							
Cours	se Syn	opsis		Geo	graphic	c informat	tion syste	m (GIS)	is a da	ta manag	gement,	
				ana	lysis, aı	nd mappin	g system.	GIS inte	grates lo	cation da	ta with	
				all f	forms of	f descripti	ve informa	ation to c	reate a m	ap. This	lays the	
				gro	undwor	k for map	oping and	analysis	in rese	arch and	nearly	
				eve	ry secto	or.						
				Bas	ic In	troduction	to R	emote	Sensing,	Conce	pt of	
				Pho	togram	metry, Rei	mote Sens	ing: Appl	lications	and Error	·s.	
Cours	se Out	tcomes:										
At the	end o	of the course	e students w	ill be al	ole to:							
CO1	Ana	yze the bas	ic compone	nts of C	SIS							
CO2	Clas	sify the ma	ps, coordina	te syste	ms and	projection	ns					
CO3	Proc	ess spatial a	and attribute	e data ai	nd prepa	are themat	ic maps					
CO4	Iden	tify and rec	tify mappin	g inaccu	uracies							
Mapp	Mapping of Course Outcomes (COs) to Program Outcomes (POs) & Program Specific Outcomes:							comes:				
COs		PO1	PO2	PO3	PO3 PO4 PO5 PO6 PSO1 PSO2 PSO3 PSO4							
CO1		1	1	1	1	-	-	-	_	1	1	
CO2		2	1	-	-	-	-	-	-	1	1	
CO3		-	1	-	1	-	-	-	-	1	1	



CO4	1	2	1	2	2	-	-	-		1	1
Average	1	1.25	1	1	2	-				1	1
Course Content:											
L	T (Hours/Week) P CL Total Hour/W							/Week			
(Hours/W	(Hours/Week) (Hours/Week)										
eek)											
3		-					-			3	
Unit				Cor	ntent and (	Compe	tency				
1	Mapping	concepts,	, analysis	s with j	paper base	ed map	s, limita	tions,	Comp	outer Au	tomated
	Cartograp	ohy. C2 (U	Jnderstan	d), Hist	ory and De	evelopr	nents, G	IS- De	efinitio	n, advar	ntages of
	digital m	aps. C2	(Underst	and), p	rojections	and co	ordinate	e syste	ems. C	C1 (Ren	nember),
	Information Systems, Modelling Real World Features Data.C1 (Remember), Data Models										
	- Spatial and Non-spatial, Components, Data Collection and Input, Data Conversion,										
	Metadata. C4 (Analyze)										
2	Database Structures, Files; Standard Data Formats, Compression Techniques. C5										
	(Evaluate)	), Explair	n the con	ncepts o	of Hardwa	re and	Softwar	e. C2	(Und	erstand)	, Define
	Types of	Errors, E	diting an	d Error	Rectificat	ion. C2	2 (Under	stand)	, Anal	yze the	types of
	Topology	. C4 (A	.nalyze),	Model	ling topol	ogical	Relation	nships	and	Toleran	ces. C4
	(Analyze)	)									
3	Explain th	he concep	ots of Pro	ximity	Analysis, (	Overlay	Analys	is, But	ffer Aı	nalysis, l	Network
	Analysis.	C2 (Und	erstand),	Recall	the purpos	e of the	e Route	alignr	ment, (	Canal ali	gnment;
	Digital E	levation I	Models.	C1 (Re	member),	Descrit	be Map	comp	osition	, Prepar	ation of
	qualitative and quantitative maps. C2 (Understand)										
4	Explain th	ne princip	les of Un	derstand	ding the Re	quirem	ents, Ph	ases of	f Planr	ning. C2	
	(Understa	(Understand), Specifications, and Procedure for analysis projects and design projects. C5									
	(Evaluate)										
Looming		and Cont	oot How	nc							

Learning Strategies and Contact Hours

Learning Strategies	Contact Hours
---------------------	---------------



Lecture	32
Practical	
Seminar/Journal Club	2
Small group discussion (SGD)	2
Self-directed learning (SDL) / Tutorial	1
Problem Based Learning (PBL)	2
Case/Project Based Learning (CBL)	2
Revision	4
Others If any:	
Total Number of Contact Hours	45

#### **Assessment Methods:**

Formative	Summative
Multiple Choice Questions (MCQ)	Mid Semester Examination 1
Viva-voce	Mid Semester Examination 2
Objective Structured Clinical Examination	University Examination
(OSCE)	
Objective Structured Practical Examination	Dissertation
(OSPE)	
Quiz	Multiple Choice Questions (MCQ)
Seminars	Short Answer Questions (SAQ)
Problem Based Learning (PBL)	Long Answer Question (LAQ)
Journal Club	Practical Examination & Viva-voce
	Objective Structured Clinical Examination (OSCE)
	Objective Structured Practical Examination (OSPE)

Nature of Assessment	CO1	CO2	CO3	CO4
Quiz	✓	✓	✓	✓
Assignment / Presentation	✓	✓	✓	$\checkmark$



Unit test		✓	<ul> <li>✓</li> </ul>	✓	✓				
Mid Semester E	xamination 1	✓	✓	✓	✓				
Mid Semester E	xamination 2	✓	✓	✓	✓				
University Exam	✓	✓	•	<ul> <li>✓</li> </ul>					
Feedback Proce	dback Process     1. Student's Feedback								
References:	Books								
	1. Geographic Information systems and Science, Paul Longley., John Wiley & Sons,								
	4th Edition,2015.								
	2. Introduction to Geog	eographic Information Systems, 9th Edition, Kang Tsung							
	Chang., Tata Mc Graw	aw Hill Publishing Company Ltd, New Delhi, 2018.							
	3. Concepts and Techni	chniques of Geographic Information Systems, C.P.Lo & Albert							
	K. W.Yeung, second E	dition, Prent	tice Hall Ind	ia Pvt. Ltd,	2016.				
	References:								
	1. Principles of GIS for	Land Reso	urce Assessi	nent, Burro	ugh, P.A., Oxford				
	Publications, 2005.								
	2. The design and imple	2. The design and implementation of Geographic Information Systems, John E.							
	Harmon & Steven J. An	Harmon & Steven J. Anderson., John Wiley & Sons, 2003.							



			F	aculty of	Engineer	ing & Tec	hnology				
Name of the	he Depar	tment			Civil Engineering						
Name of th	he Progra	am			Master of Technology in Civil Engineering (Remote Sensing						
	-				and GIS)	-		-		-	
Course Co	ode				13160139						
Course Tit	tle				Photogra	mmetry					
Academic	Year				Ι						
Semester					Ι						
Number o	f Credits				3						
Course Pr	erequisit	e			NIL						
Course Sy	-				Fundamental of aerial photography system, scale, Stereoscopes, Analytical Photogrammetry, aerial triangulation, digital Photogrammetry, unmanned air vehicle and its application.						
Course Ou	itcomes:										
At the end	of the co	urse, stu	dents	will be ab	le to:						
CO1	Acquire	e, meası	ire and	analyze a	aerial photo	ographs					
CO2	Interpre	et aerial	photog	graphs							
CO3	Perform and UA		ation o	f photos t	o generate	ortho phot	tos and mo	osaics us	ing aerial pho	tographs	
CO4	Analyz	e the po	int clo	ud data fo	or documen	tation and	archiving	g of featu	res		
Mapping of	of Course	e Outco	mes (C	COs) to P	rogram O	utcomes (	POs)& P	rogram S	Specific Outc	omes:	
COs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	
CO1	3	1	2		3	1	-	-	1	2	
CO2	3	2	2		-	1	_	2	3	2	
			Z	-		-			3		
CO3	3	2		-	-	-	-	1		2	
CO4	3	2	3	3	1	-	-	2	3	2	
Average	3.0	1.8	2.3	3	2	1	-	1.3	2.5	2.0	
Course Co	ontent:										
L	(Hours/W	eek)		T (Hour	s/Week)	<b>P</b> (I	Hours/Weel	k)	Total Hou	r/Week	
	3			(	)		0		3		



Content & Competencies
Historical development –classification, application–analogue and digital cameras–geometry of vertical photographs. C1 (Remember)
Scale – coordinate transformations, relief displacement – tilted and oblique photographs, Flight Planning, Interpretation keys. C2 (Understand)
Stereoscopes, stereoscopic view and its exaggeration – parallax equation – parallax measurement. C2 (Understand)
Parallax bar-measurement of heights and determination of slopes- stereoscopic plotting instruments. C1 (Remember)
Concepts of orientation-interior, relative and absolute orientation of aerial photographs C1 (Remember) Aerial triangulation, Block adjustment, Ortho photos, Kinds of mosaics- controlled, semi-controlled, uncontrolled. C2 (Understand)
Automatic DTM acquisition from stereo pairs or image blocks. C1 (Remember)Colour balancing, Digital image enhancement, Feature extraction. C2 (Understand)DEM Applications in Civil Engineering. C2 (Understand)
<ul> <li>History of unmanned air vehicle (UAV) development. C2 (Understand)</li> <li>Classifications and components of UAVs – Design standards and Regulatory aspects. C2 (Understand)</li> <li>Environment, Budget &amp; Time, Airframe Design &amp; Payload, Flight planning, Mosaicing, Ground control. C3 (Application)</li> <li>Feature detection and mapping, Point cloud, 3D Models, C3 (Application)</li> <li>DEM generation, Ortho photo generation, UAV Applications. C2 (Understand)</li> </ul>

<b>Teaching - Learning Strategies</b>	Contact Hours	
Lecture	32	
Practical		
Seminar/Journal Club	2	
Small group discussion (SGD)	2	
Self-directed learning (SDL) / Tutorial	1	
Problem Based Learning (PBL)	2	
Case/Project Based Learning (CBL)	2	
Revision	4	
Others If any:		



Total Number of Contact Hours	45

# **Assessment Methods:**

Formative	Summative
Multiple Choice Questions (MCQ)	Mid Semester Examination 1,2, End term
Viva-voce	
Objective Structured Practical Examination (OSPE)	University Examination
Quiz	Multiple Choice Questions (MCQ)
Seminars	Multiple Choice Questions (MCQ)
Problem-Based Learning (PBL)	Short Answer Questions (SAQ)
Journal Club	Long Answer Question (LAQ)
	Practical Examination & Viva-voce

Nature of Assess	ment		CO1	CO2	CO3	CO4	
Assignment / Pres	✓	✓	✓	✓			
Mid-Semester Exa	✓	✓	✓	<ul> <li>✓</li> </ul>			
Mid-Semester Exa		✓	✓	✓	✓		
University Examin	nation		✓	✓	✓	✓	
Feedback Proces	1. Student's Feedback						
	2. Course Exit	xit Survey					
<b>References:</b>							
	<ol> <li>Digital Photogrammetry Theory and Applications, Wilfried Linder., Springer 2013</li> <li>Unmanned Aircraft Systems, Reg Austin, Wiley Publications, 2010</li> <li>Aerial Photography and Image Interpretation, Paine D. P., Kiser J. D., John Wiley &amp; Sons, Inc., 2012.</li> <li>Introductory Course in Photogrammetry, Zorn H.C., Sixth Edition, ITC, Netherlands, 1980.</li> </ol>						



BOOKS:
1. Elements of Photogrammetry with Application in GIS, Wolf P.R.,
Mc Graw Hill International Book Company, Fourth Edition, 2014.
2. Photogrammetry, Moffitt, Francis H. & Mikhail, Edward M.,
Harper and Row Publishers, 1980.
3.Fundamentals of Computational Photogrammetry, Sanjib K Ghosh.,
Concept Publishing Company, 2005
4.Introduction to UAV Systems, Paul Gerin F & Thomas James Gleason., Wiley Publications, 2012



				Facu	lty of 1	Engineerii	Faculty of Engineering & Technology							
Name of t	the D	epart	ment			Civil E	ngineering							
Name of t	the Pi	ogra	m				Master of Technology in Civil Engineering (Remote Sensing and GIS)							
Course C	ode					131601								
Course T	Application of Remote Sensing													
Academic	e Yea	r				Ι								
Semester						Ι								
Number o	of Cre	dits				3								
Course P	rereq	uisite				NIL								
Course Sy	Synopsis Satellites are crucial in the development of vari technologies, including global mapping, GPS, city planning. Remote sensing is only one of numerous breakthroughs made possible by satellites orbiting the globe. Remote sensing numerous applications in land use mapping, weat forecasting, environmental study and study of natu hazards etc.							PS, and c of the by the ing has weather						
Course O	utcor	nes:				11020100								
At the end	l of th	e cou	rse, st	udents	will b	e able to:								
CO1							f remote Agricultur	sensing data e, Forestry	separately	and in				
CO2	In		know					gical structure	es and Geo	morphic				
CO3					s Rem	ote Sensin	g Applicat	ions to earth	Sciences ,ur	ban and				
	CO4 regional planning CO4 Understand the concepts involved in mapping of crop acreage and yield estimation, crop damage assessment.							d vield						
CO4			on, cr	op dar	nage a	ssessment.				<u> </u>				
	est of Co	timati		1	U		n Outcom	es (POs)& Pro						
Mapping	est of Co	timati		1	U		n Outcomo PSO1	es (POs)& Pro						
Mapping Outcomes	est of Co s:	timati ourse	Outco	omes (	COs)	to Prograi			ogram Speci	fic				



CO2	2	3	2	-	-	2	-	2	3		2
CO3	2	3	2	-	-	3	-	1		3	2
CO4	2	3	3	3	3	2	-	2		3	1
Average	2	3	2.5	0.8	1.5	2.5	-	2		3.0	1.5
Course C	onten	nt:									
L (I	Hours	s/Wee	ek)		T (H	ours/Week)	<b>P</b> (	Hours/Week)		Total	
										Hour/	Week
	3					0		0			3
Sr. No.		Con	tent &	& Con	npeter	ncies	I				
1		Rocks types, forms, Minerals and their field characteristics, Image interpretation for delineation of lithology (Rocks) and minerals (C1, Remember), Geological structures - Folds, Faults and Joints and their field characteristics C1 (Remember), Various important land forms (C2, Understand) Image characteristics of geological structures and major land forms (C2, Understand)									
2		Field Application: Urban Planning and management, Application of Archeology, Agriculture (C2, understand) Application in Disaster management, wet land management (C2, Understand) Wildlife management, Forest management (C2, Understand)									
3		Hyper spectral RS and its application; Microwave RS and its application C2 (Understand), Thermal RS and its application; Optical RS and its application									
4		C2 (Understand)P.C. I Geometica, Tacit View TNT mips, ERDAS, ENVI, Opticks, Dragon (C2, Understand)IDRISI, USGS Global Visualization Viewer (GloVis), NASA Earth Observation (NEO), USGS Earth, Explorer C2 (Understand)ESA's Sentinel data, NOAA, IPPMUS Terra, LANCE, VITO Vision, Bhuvam, MOSDAC, India- WRI C2 (Understand)									

## **Learning Strategies and Contact Hours**

Learning Strategies	Contact Hours
Lecture	32
Practical	
Seminar/Journal Club	2



Small group discussion (SGD)	2
Self-directed learning (SDL) / Tutorial	1
Problem Based Learning (PBL)	2
Case/Project Based Learning (CBL)	2
Revision	4
Others If any:	
Total Number of Contact Hours	45

## **Assessment Methods:**

Formative	Summative
Multiple Choice Questions (MCQ)	Mid Semester Examination 1
Quiz	Mid Semester Examination 2
Seminars	University Examination
Problem Based Learning (PBL)	Short Answer Questions (SAQ)
Journal Club	Long Answer Question (LAQ)

Nature of Assessment	CO1	CO2	CO3	CO4
Quiz	✓	✓	✓	✓
Assignment / Presentation	✓	✓	✓	<ul> <li>✓</li> </ul>
Unit test	✓	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>
Mid Semester Examination 1	✓	✓	✓	<ul> <li>✓</li> </ul>
Mid Semester Examination 2	✓	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>
University Examination	✓	~	✓	✓

Feedback Pr	rocess 1. Student's Feedback	
		Course Exit Survey
<b>References:</b>		
	<ol> <li>Remote Sensing: Principles and Interpretation: F. Sabins, Freeman Publication.</li> <li>Remote Sensing of the Environment by J.R. Jensen, Pearson Publication</li> </ol>	



BOOKS:
1. Remote Sensing and Image interpretation: Thomas Lilles and & R. W. Keifer,
John Wiley and Sons (3rdEd.).
2. Manual of Remote Sensing, Vol. 1, American Society of Photogrammetry.



				Facu	lty of E	ngineerin	g & Techn	ology			
Name of t	he Dep	artmer	nt			Civil E	Engineering				
Name of t	he Prog	gram				Master	Master of Technology in Civil Engineering (Remote				
							g and GIS)				
Course Co						13160	141				
Course Title							aphical Inf Lab	formation S	ystems		
Academic Year						I					
Semester						Ι					
Number o	f Cred	its				1					
Course Pr	erequi	site				NIL					
Course Synopsis					storing GIS co inform and an Users	A geographic information system (GIS) is a system for storing, analysing, and mapping data. To build a map, GIS combines location data with all types of descriptive information. This establishes the foundation for mapping and analysis in research and almost every other field. Users may use GIS to look at trends, correlations, and their location's surroundings.					
Course O	utcome	s:									
At the end	of the o	course,	student	ts will t	be able	to:					
CO1	Reca	ll and P	repare	the diff	erent g	eospatial la	ayers				
CO2	Com	pute ge	ometric	e measu	rement	s and perfo	orm spatial	analysis			
CO3	Creat	e high-	quality	maps a	and asso	ociated gra	phics				
CO4	Integ	rate dif	ferent g	geospat	ial laye	rs					
Mapping	of Cou	rse Ou	tcomes	(COs)	to Pro	gram Out	comes (PO	s)& Progra	m Specific O	utcomes:	
COs	PO	PO	PO	PO	PO	PO6	PSO1	PSO2	PSO3	PSO4	
	1	2	3	4	5						
CO1	3	1	2	-	3	1	-	-	1	1	
CO2	3	2	2	-	-	1	-	2	3	-	
CO3	3	2		-	-	-	-	1	3	-	
<b>CO4</b>	3	2	3	3	1	-	-	2	3	1	
Average	3.0	1.8	2.3	0.8	1.0	0.5	-	1.3	2.5	0.5	
Course Co	ontent:	1	1	1	1		1	1			



L (H	ours/Week)	T (Hours/Week)	P (Hours/Week)	Total Hour/Week			
	0	0	2	2			
Sr. No.	Content & Com						
1	Importing maps	and layers from various	sources (C1, Knowledge	)			
2	Geo referencing	and projection (C1, Kno	owledge)				
3	Digitization of P	Digitization of Points and Lines (C1, Knowledge)					
4	Editing Map Ele	ments (C1, Knowledge)					
5	Attribute Data E	Attribute Data Entry and Manipulation (C1, Knowledge)					
6	Cleaning, Buildi	Cleaning, Building and Transformation (C1, Knowledge)					
7	Buffer Analysis	Buffer Analysis (C1, Knowledge)					
8	Network Analysi	Network Analysis (C1, Knowledge)					
9	Data Analysis–	Data Analysis–Overlay, Buffer (C1, Knowledge)					
10	Importing maps	and layers from various	sources (C1, Knowledge	)			

Teaching - Learning Strategies	Contact Hours	
Lecture		
Practical	15	
Seminar/Journal Club		
Small group discussion (SGD)	10	
Self-directed learning (SDL) / Tutorial		
Problem Based Learning (PBL)	5	
Case/Project Based Learning (CBL)		
Revision		
Others If any:		
Total Number of Contact Hours	30	
Assessment Methods:		

 Formative
 Summative



Multiple Choice Questions (MCQ)	
Viva-voce	Practical Examination & Viva-voce
Objective Structured Practical Examination (OSPE)	University Examination
Quiz	
Seminars	
Problem Based Learning (PBL)	
Journal Club	

Nature of Assessm	nent		CO1	CO2	CO3	<b>CO4</b>	
VIVA			✓	✓	✓	✓	
Practical Log Book	k/ Record Book		✓	✓	✓	✓	
University Examin	ation		✓	•	✓	✓	
Feedback Process		<ol> <li>Student's Feedback</li> <li>Course Exit Survey</li> </ol>					
<ul> <li>Students Feedback is taken through various steps</li> <li>1. Regular feedback through the Mentor Mentee system.</li> <li>2. Feedback between the semester through Google forms.</li> <li>Course Exit Survey will be taken at the end of the semester.</li> </ul>							
References:	•						
<ul> <li>2. Workshop Technology (Manufacturing Process) –S K Garg, Laxin Publications; Fourth Edition (2018), ISBN-10: 8131806979.</li> <li>3. Principles of Manufacturing Materials and Processes - Campbell, J.S McGraw- Hill, New Edition, ISBN-10: 0070992525</li> </ul>							



Faculty of Engineering & Technology				
Name of the Department	Civil Engineering			
Name of the Program	Master of Technology in Civil Engineering (Remote			
	Sensing and GIS)			
Course Code	13160142			
Course Title	Photogrammetry Lab			
Academic Year	I			
Semester	Ι			
Number of Credits	1			
Course Prerequisite	NIL			
Course Synopsis	Understand various computer components.			

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

CO1	Understand about the Photogrammetry and its types
CO2	Identify about the stereoscopy.
CO3	Will able to learn about the analytical Photogrammetry

# Mapping of Course Outcomes (COs) to Program Outcomes (POs) & Program Specific Outcomes:

COs	PO 1	PO 2	PO 2	PO	PO 5	PO	PSO1	PSO2	PSO3	PSO4
	1	2	3	4	5	6				
CO1	3	1	2	-	3	1	-	-	1	1
CO2	3	2	2	-	-	1	-	2	3	-
CO3	3	2		-	-	-	-	1	3	-
CO4	3	2	3	3	1	-	-	2	3	1
Average	3.0	1.8	2.3	0.8	1.0	0.5	-	1.3	2.5	0.5
						· · · ·				
Course C	onten	t:								
L (Hours/Week)				T (Hours/Week)		P (Ho	P (Hours/Week)		Total Hour/Week	
0				0			2		2	



	Content & Competencies					
Sr. No.	Title					
1	Fundamentals of aerial photos and satellite image Interpretation (C3, Apply)					
2	Types of imaging (C3, Apply)					
3	Elements of interpretation (C3, Apply)					
4	Techniques of Visual interpretation (C3, Apply)					
5	Generations of Thematic maps (C3, Apply)					
6	Study of satellite image annotation (C3, Apply)					
7	Demarcation of contours & watershed (C3, Apply)					
8	Remote sensing applications (C3, Apply)					
9	Understanding of spectral response pattern of different landforms (C3, Apply)					
10	Image Interpretation and Analysis (C3, Apply)					

<b>Teaching - Learning Strategies</b>	Contact Hours	
Lecture		
Practical	15	
Seminar/Journal Club		
Small group discussion (SGD)	10	
Self-directed learning (SDL) / Tutorial		
Problem Based Learning (PBL)	5	
Case/Project Based Learning (CBL)		
Revision		
Others If any:		
Total Number of Contact Hours	30	



# **Assessment Methods:**

Formative	Summative
Multiple Choice Questions (MCQ)	
Viva-voce	Practical Examination & Viva-voce
Objective Structured Practical Examination	University Examination
(OSPE)	
Quiz	
Seminars	
Problem Based Learning (PBL)	
Journal Club	

# Mapping of Assessment with COs

Nature of Assessment			CO2	CO3	CO4
VIVA	✓	✓	✓	✓	
Practical Log Book/ Record Book	✓	✓	✓	✓	
University Examination	✓	✓	✓	✓	
Feedback Process	1. Student's Feedbac	ck			
	Course Exit Surve	ey			
Students Feedback is taken through	various steps				
1. Regular feedback through th	m.				
2. Feedback between the seme	-				



# **SEMESTER - II**

Course Code	Course Title					
13160238	Minor Project					
Choose these subjects for specialization in Transportation Engineering						
13160232	Analysis and Design of Pavement					
13160233	Transport Economics					
13160234	Traffic Engineering and Management					
13160235	Airport Infrastructure, Planning and Design					
13160236	Pavement Design Lab					
13160237	Traffic Lab					
Choose	these subjects for specialization in Structural Engineering					
13160214	Finite Element Analysis					
13160215	Theory of Elasticity and Plasticity					
13160216	Limit State Design of Steel Structures					
13160217	Earthquake Resistant Design					
13160218	Structural Engineering lab (CASTING)					
13160239	Finite Element Analysis Lab					
Choose	these subjects for specialization in Remote Sensing and GIS					
13160240	Geospatial Data Processing and Modelling					
13160241	Satellite Image Processing					
13160242	Advanced GIS					
13160243	GPS & Surveying					
13160244	Advanced GIS Lab					
13160245	Satellite Image Processing Lab					



			Fa	culty of	Engine	ering &	Technology	7				
Name of t	he Dep	partmen	nt	Civ	Civil Engineering							
Name of the Program					Master of Technology in Civil Engineering							
- (mane of each - of general							ngineering)		U			
Course Co	ode				60238		0 0,					
Course Ti	tle			Mi	nor Pr	oject						
Academic	Year			Ι								
Semester				II								
Number o	f Cred	lits		3								
Course Pr	erequ	isite		NII								
Course Sy	<b>se Synopsis</b> Minor Project will include identification of the proble based on the literature review and the methodology adopted involving scientific research, collection and analysis of data, determining solutions highlighting individuals' contribution							d				
Course Or At the end			student	s will be	e able t	0:						
CO1					eering problems by reviewing available literature.							
COI	10	lentiny c	ivii eng	gmeerin	g prob	lenis by	reviewing	available ii	lerature.			
CO2		lentify a		iate tech	niques	to anal	yze comple	x problems	s related to	civil		
CO3	In	vestigat	e and o	develop	nent o	f solutio	n					
Mapping Outcomes		irse Out	tcomes	s (COs)	to Pro	gram O	outcomes (I	POs) & Pr	ogram Spe	cific		
COs	PO 1	PO2	PO 3	PO4	PO 5	PO6	PSO1	PSO2	PSO3	PSC 4		
CO1	3	3	2	3	3	3	3	3	2	3		
CO2	3	3	2	3	3	3	3	3	2	3		
CO3	3	3	2	3	3	3	3	3	2	3		
		3	2	3	3	3	3	3				

Course Content:			
L (Hours/Week)	T (Hours/Week)	P (Hours/Week)	Total Hour/Week



0		0	6	6			
Unit		Content					
1.	suitable s	solution (C3, App	Understand), Impoly), Experiments develop the solution	and tests (C4,			

<b>Teaching - Learning Strategies</b>	Contact Hours	
Lecture		
Practical	13	
Seminar/Journal Club		
Small group discussion (SGD)		
Self-directed learning (SDL) / Tutorial	26	
Problem Based Learning (PBL)		
Case/Project Based Learning (CBL)	13	
Revision		
Others If any:		
Total Number of Contact Hours	52	

## **Assessment Methods:**

Formative	Summative
Multiple Choice Questions (MCQ)	Mid Semester Examination 1
Viva-voce	Mid Semester Examination 2
Objective Structured Practical Examination	University Examination
Quiz	Dissertation
Seminars	Multiple Choice Questions (MCQ)
Problem Based Learning (PBL)	Short Answer Questions (SAQ)
Journal Club	Long Answer Question (LAQ)



Practical Examination & Viva-voce
Objective Structured Practical Examination

Nature of Assessment	CO1	CO2	CO3	CO4
Quiz				
VIVA	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓
Assignment / Presentation				
Unit test				
Practical Log Book/ Record	✓	<ul> <li>✓</li> </ul>	✓	✓
Book/Drawing				
Mid Semester Examination 1				
Mid Semester Examination 2				
University Examination (External	✓	<ul> <li>✓</li> </ul>	✓	✓
Practical)				
Feedback Process	1. Stu	ident's Fe	edback	
Students Feedback is taken through var	ious steps			
1. Regular feedback through Mento	or Mentee s	ystem		
2. Feedback between the semester		•	18	



# Master of Technology in Civil Engineering (Transportation Engineering) 2<sup>nd</sup> Semester



Faculty of Engineering & Technology												
Name of th	ame of the Department					Civil Engineering						
Name of the Program					Master of Technology in Civil Engineering							
							ngineering)	0	0			
Course Code					60232		0 0					
Course Tit						and Des	sign of Pave	ement				
Academic	Year			Ι	·		0					
Semester				II								
Number of	Credit	5		4								
Course Pro	erequisi	te		Soi	l Mech	anics ar	nd concrete	technolo	gy			
Course Sy	-								environmental	factors		
L.	-								ad calculation,	Design,		
				and	analysi	s of flex	ible and rigio	l paveme	nt			
Course Ou			_									
At the end												
CO1						ehaviou	r of various	material	s under vario	us		
0.00				ondition								
CO2		0 1	1	hy of fle	1		nt					
CO3			<b>Ť</b>	hy of rig								
CO4				ble and	<u> </u>							
Mapping of Course Outcomes (COs) to Program Outcomes (POs) & Program Specific Outcomes:												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4		
COs CO1		PO2	PO3	PO4 3	PO5	PO6	PSO1 2	PSO2	PSO3	PSO4 3		
	2											
CO1	2 2	1	3	3	3	1	2	2	3	3		
CO1 CO2	2 2 2 2	1	3 3	3 3	3 3	1 1	2 2	2 2	3 3	3 3		
CO1 CO2 CO3	2 2 2 2 2	1 1 1	3 3 3	3 3 3	3 3 3	1 1 1	2 2 2	2 2 2 2	3 3 3	3 3 3		
CO1 CO2 CO3 CO4	2 2 2 2 2	1 1 1 1	3 3 3 3	3 3 3 3	3 3 3 3	1 1 1 1	2 2 2 2 2	2 2 2 2 2	3 3 3 3 3	3 3 3 3 3		
CO1 CO2 CO3 CO4 Average	2 2 2 2 2 2 2	1 1 1 1 1	3 3 3 3	3 3 3 3	3 3 3 3	1 1 1 1	2 2 2 2 2	2 2 2 2 2	3 3 3 3 3	3 3 3 3 3		
CO1 CO2 CO3 CO4 Average Course C	2 2 2 2 2 2 2 2 2	1 1 1 1 1 :	3 3 3 3	3 3 3 3 3	3 3 3 3 3	1 1 1 1 1	2 2 2 2 2	2 2 2 2 2 2	3 3 3 3 3	3 3 3 3 3 3		
CO1 CO2 CO3 CO4 Average Course C	2 2 2 2 2 2 2	1 1 1 1 1 :	3 3 3 3	3 3 3 3 3	3 3 3 3	1 1 1 1 1	2 2 2 2 2 2 2	2 2 2 2 2 2	3 3 3 3 3 3	3 3 3 3 3 3		
CO1 CO2 CO3 CO4 Average Course C	2 2 2 2 2 2 2 4 5 0ntent Hours/W 3	1 1 1 1 1 :	3 3 3 3	3 3 3 3 3	3 3 3 3 3 0urs/We	1 1 1 1 1	2 2 2 2 2 2 2	2 2 2 2 2 2	3 3 3 3 3 3 Total Hour	3 3 3 3 3 3		
CO1 CO2 CO3 CO4 Average Course C L ()	2 2 2 2 2 2 2 4 5 0ntent Hours/W 3	1 1 1 1 : eek)	3 3 3 3	3 3 3 3 3 T (He	3 3 3 3 3 0urs/We	1 1 1 1 1 2 eek)	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2 2 2 2 2 2 2	3 3 3 3 3 3 Total Hour/ 4	3 3 3 3 3 /Week		
CO1 CO2 CO3 CO4 Average Course C L (1 Uni	2 2 2 2 2 2 2 4 5 0ntent Hours/W 3	1 1 1 1 : eek)	3 3 3 3 3	3 3 3 3 3 T (He	3 3 3 3 3 0urs/We 1	1 1 1 1 1 eek)	2 2 2 2 2 2 2 2 P (Hours/W 0 Content ent of pavem	2 2 2 2 2 2 7 eek)	3 3 3 3 3 3 Total Hour	3 3 3 3 3 /Week		
CO1 CO2 CO3 CO4 Average Course C L (1 Uni	2 2 2 2 2 2 2 4 5 0ntent Hours/W 3	1 1 1 1 : eek) Cla Dis	3 3 3 3 3 assify t	3 3 3 3 3 T (He he types the fac	3 3 3 3 3 3 0urs/We 1 5 and co	1 1 1 1 1 2 eek) ompone affectin	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	3       3       3       3       3       3       2, Understand       erformance	3 3 3 3 3 /Week		
CO1 CO2 CO3 CO4 Average Course C L (1 Uni	2 2 2 2 2 2 2 4 5 0ntent Hours/W 3	1 1 1 1 : eek) Cla Dis pa	3 3 3 3 3 assify t scuss vement	3 3 3 3 3 T (He he types the fac is(C2, U	3 3 3 3 3 3 0urs/We 1 s and co ctors	1     1     1     1     1     eek)   ompone affectin and), Ex	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	3 3 3 3 3 3 Total Hour/ 4 2, Understand erformance (c ce of Highwa	3 3 3 3 3 /Week		
CO1 CO2 CO3 CO4 Average Course C L (1 Uni	2 2 2 2 2 2 2 4 5 0ntent Hours/W 3	1 1 1 1 : eek) Cla Dis pav and	3 3 3 3 3 assify t scuss vement d airpo	3 3 3 3 3 T (He he types the fac ss(C2, U rt paver	3 3 3 3 3 3 3 0urs/We 1 s and co ctors (ndersta ments (	1     1     1     1     1     1     eek)   ompone affectin and), Ex (C2, Un	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	3       3       3       3       3       3       2, Understand       erformance	3 3 3 3 3 /Week		
CO1 CO2 CO3 CO4 Average Course C L (1 Uni 1.	2 2 2 2 2 2 2 4 5 0ntent Hours/W 3	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	3 3 3 3 3 3 assify t scuss vement d airpo vement	3 3 3 3 3 T (He he types the fac ss(C2, U rt paver	3 3 3 3 3 3 3 5 5 5 5 5 5 5 5 5 5 5 5 5	1     1     1     1     1     1     eek)   ompone affectin and), Ex (C2, Un C1, rem)	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2       2       2       2       2       2       2       and per gnifican       Define the second	3         3         3         3         3         3         4         2, Understand erformance of constructions of thighwater functions of thighwater functis of thighwater functions of thighwater funct	3 3 3 3 3 /Week		
CO1 CO2 CO3 CO4 Average Course C L (1 Uni	2 2 2 2 2 2 2 4 5 0ntent Hours/W 3	1 1 1 1 eek) Cla Dis pav and pav Ex	3 3 3 3 3 3 assify t scuss vement d airpo vement plain t	3 3 3 3 3 3 T (He he types the fac ss(C2, U rt paver composition	3 3 3 3 3 3 3 3 5 and co ctors finderstanents ( nents ( cept o	1         1         1         1         1         eek)         ompone         affectin         and), Ex         (C2, Un         C1, rem         f         desig	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2       2       2       2       2       2       2       2       2       dents (C2       and per       gnifican       Define th       pad (C2	3         3         3         3         3         3         3         3         3         4         2, Understand         erformance         ce of Highwa         ne functions of         , Understand	3 3 3 3 3 /Week		
CO1 CO2 CO3 CO4 Average Course C L (1 Uni 1.	2 2 2 2 2 2 2 4 5 0ntent Hours/W 3	1 1 1 1 1 ceek) Cla Dis pav and pav Ex Dis	3 3 3 3 3 3 3 assify t scuss vement d airpo vement plain t scuss	3 3 3 3 3 3 T (He he types the fac s(C2, U rt paver composition the str	3 3 3 3 3 3 3 3 3 5 and co ctors findersta ments ( nents ( cept o ength	1         1         1         1         1         eek)         ompone         affectin         and), Ex         (C2, Un         C1, rem         f desig         charact	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2         and per         pavem	3         3         3         3         3         3         4         2, Understand erformance of constructions of thighwater functions of thighwater functis of thighwater functions of thighwater funct	3 3 3 3 3 /Week		



	equivalent wheel loads (C2, Understand), Discuss aircraft loading,
	gear configuration and tyre pressure (C2, Understand). Explain
	the drainage - Estimation of flow, surface drainage, sub-surface
	drainage systems, design of sub-surface drainage structures (C2,
	Understand).
3	Discuss empirical, semi-empirical and theoretical approaches (C2,
	Understand), Explain the design of highway and airport pavements by
	IRC, AASHTO Methods (C2, Understand), Describe the applications of
	pavement design software (C2, Understand)
4.	Discuss the types of joints and their functions, joint spacing (C2,
	Understand); Explain the design of CC pavement for roads,
	highways and airports as per IRC, AASHTO, design of joints
	(C2, Understand). Explain the design of continuously reinforced
	concrete pavements (C2, Understand). Explain the reliability; Use
	of software for rigid pavement design (C2, Understand).

Teaching - Learning Strategies	Contact Hours	
Lecture	40	
Practical		
Seminar/Journal Club		
Small group discussion (SGD)		
Self-directed learning (SDL) / Tutorial	6	
Problem Based Learning (PBL)	8	
Case/Project Based Learning (CBL)	3	
Revision	3	
Others If any:		
Total Number of Contact Hours	60	

#### **Assessment Methods:**

Formative	Summative
Quiz	Mid Semester Examination 1
Seminars	Mid Semester Examination 2
Problem Based Learning (PBL)	University Examination
	Short Answer Questions (SAQ)
	Long Answer Question (LAQ)



Nature of Assessment	CO1	CO2	CO3	CO4
Quiz	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	$\checkmark$
VIVA				
Assignment / Presentation	✓	✓	<ul> <li>✓</li> </ul>	✓
Unit test	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓
Practical Log Book/ Record Book				
Mid Semester Examination 1	✓	<ul> <li>✓</li> </ul>	✓	✓
Mid Semester Examination 2	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓
University Examination	✓	✓	✓	✓
Feedback Process	1. Stu	ıdent's Fe	edback	
Students Feedback is taken throug 1. Regular feedback through 2. Feedback between the sem <b>References:</b>	Mentor M	entee syst		
Text Books(i) Yoder and V(ii) Yang. H. HHall Inc.(iii) Rajib B. Nand Practice, C	luang, Pave Iallick and ' RC Press (' Hudson, R McGraw H	ment Anal Tahar El-H Taylor and alph Haas	lysis and l Korchi, Pa l Francis (	t Design, John Wiley and Sons Design, Second Edition, Prentice avement Engineering – Principles Group) swki, Modern Pavement



			Facı	ulty of H	Engine	ering &	z Technolog	<b>y</b>			
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Name of th	-				Master of Technology in Civil Engineering						
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COs CO1	PO1 2	2	PO3 2	PO4 3	PO5	PO6	PSO1 2	PSO 2	2 PSO 3	-	PSO4 3
COs CO1 CO2	PO1 2 2	2 2	PO3 2 2	PO4 3 3	PO5 2 2 2	PO6 2 2	PSO1 2 2	PSO 2 2	2 PSO 3 3	-	PSO4 3 3
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COs CO1 CO2 CO3 CO4 Average Course C L (1 Uni	PO1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2 2 2 2 2 2 Veek)	PO3 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	PO4 3 3 3 3 3 T (He transp ation der derstand he dema curve (C ation der , Implen	PO5 2 2 2 2 2 2 2 0 0 0 0 0 0 0 0 0 0 0 0	PO6 2 2 2 2 2 2 2 eek) n ecor C2, Un mine do nction c derstand und peal ice elast	PSO1 2 2 2 2 2 2 2 2 P (Hours/W 0 Content nomics (C2 derstand), E eterminants curve (C2, U d), Compa	PSO 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2 PSO 3 3 3 3 3 Total Ho derstand), demand cla mand (C4, and), Discu temporal v sures to m 3, Apply),	3 Dur/V 3 E assifi Ana uss s variat itigat Impl	PSO4 3 3 3 3 3 3 Week Kxplain ication alyze), hift in ion of te (C4, lement



NAAC	

	model (C2, Understand), Distinguish direct and cross elasticity (C4,
	Analyze).
2.	Describe supply curve (C2, Understand), Explain the determinant of
	supply (C2, Understand), Explain the price elasticity of supply (C2,
	Understand), Implement determinant of price elasticity of supply (C3,
	Apply), Discuss constant elasticity supply function (C2, Understand),
	Contrast demand supply equilibrium and in-equilibrium (C4, Analyze).
3.	Explain consumer surplus (C2, Understand), Describe change in
	consumer surplus (C2, Understand), Explain latent demand (C2,
	Understand), Define producer surplus (C2, Understand), Classify
	change in producer surplus (C2, Understand), Explain Income elasticity
	(C2, Understand).
4.	Explain behavior analysis and its objective and application (C2,
	Understand). Organize Travel Behavior Analysis (TBA) (C4, Analyze),
	Explain Application of TBA (C2, Understand), Define Basic steps of
	TBA (C2, Understand), Design of survey instrument (C6, Create),
	Define Data types in behavior analysis (C2, Understand), Explain
	Preference elicitation techniques (C2, Understand), Develop Discrete
	choice experiment (C6, Create), Identification of attributes and its levels
	(C2, Understand), Conjecture of alternatives (C6, Create), Investigate
	Factorial design (C6, Create).

Teaching - Learning Strategies	Contact Hours	
Lecture	38	
Practical		
Seminar/Journal Club		
Small group discussion (SGD)		
Self-directed learning (SDL) / Tutorial		
Problem Based Learning (PBL)	5	
Case/Project Based Learning (CBL)		
Revision	2	
Others If any:		
Total Number of Contact Hours	45	

#### **Assessment Methods:**

Formative	Summative
Objective Structured Practical Examination	Mid Semester Examination 1
Quiz	Mid Semester Examination 2
Seminars	University Examination
Problem Based Learning (PBL)	Short Answer Questions (SAQ)
	Long Answer Question (LAQ)



Nature of Assessme	ent	CO1	CO2	CO3	CO4
Quiz		✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	$\checkmark$
VIVA					✓
Assignment / Presen	itation	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓
Unit test		✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓
Practical Log Book/	Record Book				
Mid Semester Exam	ination 1	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓
Mid Semester Exam	ination 2	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓
University Examinat	tion	✓	✓	<ul> <li>✓</li> </ul>	✓
Feedback Process		1. Stu	ident's Fe	edback	
Students Feedback is 1. Regular feed 2. Feedback bet	back through M	lentor M	entee syst		
References:					
	Company, Penn 2. CRRI, Road	sylvania User Cos	, 1969 st Study i	n India, I	ghways, International Textbook New Delhi, 1982 n of Highway Projects in India,



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Course Tit							ing and Ma	anagem	nent			
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Course Ou	tcome	s:			P							
At the end			student	s will be	e able t	o:						
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interpretation				iourn (	acout	the th	anne staan		101000050	ing unit		
CO2				ırn abou	t the sr	eed stu	dv					
CO3					<b>1</b>		ind of traffi	c contro	ol system			
<u>CO4</u>				rn abou				e contro	n system			
								P() &	Program Spe	cific		
Outcomes				(003)		gram O	accomes (1	<b>()</b> ()) <b>(</b>	i iogram ope	cinc		
COs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO	2 PSO3	PSO4		
CO1	3	1	3	3	2	2	2	2	3	3		
<b>CO2</b>	3	1	3	3	2	2	2	2	3	3		
CO3	3	1	3	3	2	2	2	2	3	3		
CO4	3	1	3	3	2	2	2	2	3	3		
Average	3	1	3	3	2	2	2	2	3	3		
Trenge	U	-	U	U		-	-		U	U		
Course C	'onter	nt•										
				Т	ours/We	ook)	P (Hours/V	Vook)	Total Hour	Wook		
	L (Hours/Week)			1 (11)	0	CK)		VCCK)	3	WEEK		
Unit					U		Content		5			
<u> </u>	ll	De	fing E	Poad us	or $(C1)$	Dama		icle an	d road way.	Vehicle		
1.						,			~			
					cs –Discuss IRC standards (C2, Understand) - Design me. Highway capacity and levels of service (C6,Create) -							
		-			-	• •	•		PCU concept			
		-		correction of the definition					co concept	unu no		
2				· ·			(C1 Roma	mber)	Demonstrate	Parking		
2. Define Roa				voau us	ou ide	mucs		1110CL)-		1 ar King		
				(C3)	Δnnl		· · ·	e trac		le-wave		
		fac	cilities			); Dis	cuss Cycl		ks and cyc			
		fac (C	cilities 2,Unde	erstand),	Pedes	r); Dis trian fao	cuss Cycl cilities. Exa	mine T		studies,		

Parking studies, Accident studies (C4, Analyze)



3.	Design of Alignment - Cross sectional elements (C6, Create), Use of Stopping
	and passing sight distance (C3, Apply). Design of Horizontal curves and
	Vertical curves (C6, Create). Design problems(C3, Apply)
4.	Understand Signs and markings in Traffic System Management (C2,
	Understand); Design of at-grade intersections (C6, Create), Principles of
	design - Channelization - Design of rotaries(C6, Create); design of Traffic
	signals - pre-timed and traffic actuated. Design of signal setting - phase
	diagrams, timing diagram, signal coordination (C6, Create);

Teaching - Learning Strategies	Contact Hours	
Lecture	35	
Practical		
Seminar/Journal Club		
Small group discussion (SGD)		
Self-directed learning (SDL) / Tutorial		
Problem Based Learning (PBL)	4	
Case/Project Based Learning (CBL)	4	
Revision	2	
Others If any:		
Total Number of Contact Hours	45	

#### **Assessment Methods:**

Formative	Summative
Objective Structured Practical Examination	Mid Semester Examination 1
Quiz	Mid Semester Examination 2
Seminars	University Examination
Problem Based Learning (PBL)	Short Answer Questions (SAQ)
	Long Answer Question (LAQ)

Nature of Assessment	CO1	CO2	CO3	CO4
Quiz	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓
VIVA				
Assignment / Presentation	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓
Unit test	✓	✓	<ul> <li>✓</li> </ul>	✓
Practical Log Book/ Record Book				
Mid Semester Examination 1	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓
Mid Semester Examination 2	<ul> <li>✓</li> </ul>	✓	<ul> <li>✓</li> </ul>	✓
University Examination(External Practical)	✓	✓	✓	✓



Feedback Process		1. Student's Feedback				
Students Feedback	s taken through various steps					
1. Regular fee	back through Mentor Mentee system					
2. Feedback b	etween the semester through Google forms					
References:						
	Text Books					
	(i) ITE Hand Book, High	way Engineering Hand Book, McGraw - Hill				
	(ii) R. J. Salter and N. B.	Hounsel, Highway Traffic Analysis and Design,				
	Macmillan Press Ltd, 1996					
	(iii) AASHTO A Policy of	n Geometric Design of Highway and Streets				
	(iv) John Wiley & Sons I	nc., ITE Brian, Traffic Engineering handbook				



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				,	(Transportation Engineering)												
Course Co					13160235												
Course Tit	le			Air	port I	nfrastri	ucture, Plan	ning a	nd Design								
Academic	Year			Ι													
Semester				II													
Number of	f Credi	its		3													
Course Prerequisite					port Ei	ngineeri	ng										
Course Sy	nopsis			ICA	AO sta	andard	for airport	and a	air traffic op	peration,							
						•			, Concept of	-							
									laws, Capac								
								iy desi	gn, Taxiway	design,							
				Ma	rking &	& signal	, Lighting										
Course Ou																	
At the end																	
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CO2				able to u	unders	tand the	different teo	chnique	es used for air	traffic							
		lculatio															
CO3								-	runway orient	ation							
CO4							ICAO stand		-								
		rse Out	tcomes	( <b>COs</b> ) 1	to Pro	gram O	outcomes (P	<b>Os</b> ) &	Program Spe	cific							
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COs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO	2 PSO3	PSO4							
CO3	PO1 3	PO2 2	PO3 3	PO4 3	PO5 2	PO6	PSO1 2	PSO 2	2 PSO3 3	PSO4 3							
CO1	3	2	3	3	2	1	2	2	3	3							
CO1 CO2	3 2	2 3	3 2	3 3	2 2	1 1	2 2	2 2	3 3	3 3							
CO1 CO2 CO3	3 2 2	2 3 3	3 2 2	3 3 3	2 2 2	1 1 1	2 2 2	2 2 2	3 3 3	3 3 3							
CO1 CO2 CO3 CO4	3 2 2 2 2	2 3 3 3	3 2 2 3	3 3 3 3	2 2 2 2 2	1 1 1 1	2 2 2 2 2 2	2 2 2 2 2	3 3 3 3 3	3 3 3 3 3							
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CO1 CO2 CO3 CO4 Average Course C L (1 Uni	3 2 2 2.5 Conter Hours/V 3	2 3 3 2.75 mt: Week)	3 2 3 2.5 roduct 4, Ana	3 3 3 3 3 T (Ho ion to Io lyze), U nd)	2 2 2 2 2 2 2 2 2 2 2 0 0 CAO s Jnderst	1     1     1     2   eek) tandard and air	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2 2 2 2 2 2 2 2 (reek)	3       3       3       3       3       3       3       5. Planning for zoning laws expression	3 3 3 3 3 /Week							
CO1 CO2 CO3 CO4 Average Course C L (1 Uni 1.	3 2 2 2.5 Conter Hours/V 3	2 3 3 2.75 mt: Week)	3 2 2 3 2.5 roduct 4, Ana derstan	3 3 3 3 3 T (He ion to IC lyze), U nd) nd vario	2 2 2 2 2 2 2 2 2 0 0 CAO s Jnderst	1         1         1         2         eek)         tandard air         hods of	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2 2 2 2 2 2 2 2 2 eek) erstand) nents, 2	3       3       3       3       3       3       3       Total Hour       3	3 3 3 3 3 /Week							
CO1 CO2 CO3 CO4 Average Course C L (1 Uni 1.	3 2 2 2.5 Conter Hours/V 3 it	2 3 3 2.75 mt: Week)	3 2 3 2.5 roduct 4, Ana iderstan pacity	3 3 3 3 3 T (He ion to I0 lyze), U nd) nd vario determin	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	1         1         1         2         eek)         tandard         and air         hods of         method	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2 2 2 2 2 2 2 (reek) (restand) nents, 2 orecast 2 (recast 2)	3       3       3       3       3       3       3       0. Planning for zoning laws end ing (C2, Under ing C2,	3 3 3 3 3 /Week r airport tc. (C2, erstand),							
CO1 CO2 CO3 CO4 Average Course C L (1 Uni 1.	3 2 2 2.5 Conter Hours/V 3 it	2 3 3 2.75 nt: Week) Int (C- Un Ca Ru	3 2 3 2.5 roduct: 4, Ana iderstan iderstan pacity inway p	3 3 3 3 3 T (He ion to IC lyze), U nd) nd vario determin patterns	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	1         1         1         2         eek)         tandard         and air         hods of         method         and und	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	3       3       3       3       3       3       3       0. Planning for zoning laws expression	3       3       3       3       3       3       /Week       r airport       tc. (C2,       erstand),							



	radius exit taxiways (C6, Create)
4.	Design principles of critical, semi-critical, non-critical airport
	pavements and FAA and PCA methods (C6, Create). Airport hangars,
	their planning and design criteria (C5, Evaluate
	C6, Create)
т 1. т ·	

Teaching - Learning Strategies	Contact Hours	
Lecture	32	
Practical		
Seminar/Journal Club		
Small group discussion (SGD)		
Self-directed learning (SDL) / Tutorial		
Problem Based Learning (PBL)	5	
Case/Project Based Learning (CBL)	5	
Revision	3	
Others If any:		
Total Number of Contact Hours	45	

#### **Assessment Methods:**

Formative	Summative
Quiz	Mid Semester Examination 1
Seminars	Mid Semester Examination 2
Problem Based Learning (PBL)	University Examination
	Short Answer Questions (SAQ)
	Long Answer Question (LAQ)

Nature of Assessment	CO1	CO2	CO3	CO4			
Quiz	✓	✓	<ul> <li>✓</li> </ul>	✓			
VIVA							
Assignment / Presentation	<ul> <li>✓</li> </ul>	✓	<ul> <li>✓</li> </ul>	✓			
Unit test	✓	✓	<ul> <li>✓</li> </ul>	✓			
Practical Log Book/ Record Book							
Mid Semester Examination 1	~	✓	<ul> <li>✓</li> </ul>	✓			
Mid Semester Examination 2	✓	✓	<ul> <li>✓</li> </ul>	✓			
University Examination	✓	✓	<ul> <li>✓</li> </ul>	✓			
	I	L	1	1			
Feedback Process	1. Student's Feedback						



Students Feedback	is taken through various steps					
1. Regular feed	back through Mentor Mentee system					
2. Feedback be	tween the semester through Google forms					
References:						
	Text Books					
	(i) Airport Engineering, N.J. Ashford, P.H. Wright, John Wiley					
	(ii) Planning and Design of Airports, R.M. Horonjeff, F.X. McKelvey,					
	W.J Sproule, Seth Young					
	(iii) Airport Planning & Management, Wells, Alexander; Young, Seth,					
McGraw Hill						
	(iv) TMH International Publishers					
	(v) Airport Engineering (Planning and Design), S.C Saxena, CBS					
	Publisher					



			Facu	ulty of I	Engine	ering &	& Technolog	gy				
Name of th	ne Dep	artmer	nt	Civ	Civil Engineering							
Name of th	ne Prog	gram		Ma	Master of Technology in Civil Engineering							
				(Tr	(Transportation Engineering)							
<b>Course Co</b>	de			131	13160236							
Course Tit	tle			Pav	Pavement Design Lab							
Academic	Year			Ι								
Semester				II								
Number of	f Credi	its		1								
Course Pro	erequi	site		Hig	ghway	Engine	ering lab					
Course Synopsis					derstan	ding th	ne effect of v	various e	environmental	factors		
				effe	ecting	the par	vement desig	gn, Traf	fic load calc	ulation,		
				Des	sign, a	nd anal	ysis of flexi	ble and	rigid pavemer	nt using		
	E-la	ayer an	d IITP	AVE								
Course Ou	itcome	s:										
At the end												
CO1								s for the	e pavement de	esign		
CO2				luation a								
CO3	So	oftware	applica	ation in 1	road pa	vemen	t design					
<b>CO4</b>	De	esign ar	nd evalu	uation of	f multi	layer p	avement syst	em				
Mapping of	of Cou	rse Out	tcomes	(COs)	to Pro	gram (	Outcomes (F	Os) & 1	Program Spe	cific		
Outcomes:	:											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4		
COs CO1	PO1 3	PO2 2	PO3 3	PO4 2	PO5 3	PO6	PSO1 2	PSO2 2	PSO3 3	PSO4 3		
CO1	3	2	3	2	3	2	2	2	3	3		
CO1 CO2	3 2	2 1	3 2	2 2	3 3	2 3	2 2 2	2 2	3 3	3 3		
CO1 CO2 CO3	3 2 3	2 1 2	3 2 1	2 2 3	3 3 2	2 3 1	2 2 2 2	2 2 2 2	3 3 3	3 3 3		
CO1 CO2 CO3 CO4	3 2 3 3	2 1 2 2	3 2 1 2	2 2 3 3	3 3 2 2	2 3 1 1	2 2 2 2 2 2	2 2 2 2 2	3 3 3 3 3	3 3 3 3 3		
CO1 CO2 CO3 CO4 Average	3 2 3 3 2.75	2 1 2 2 1.75	3 2 1 2	2 2 3 3	3 3 2 2	2 3 1 1	2 2 2 2 2 2	2 2 2 2 2	3 3 3 3 3	3 3 3 3 3		
CO1 CO2 CO3 CO4 Average Course C	3 2 3 3 2.75	2 1 2 1.75 nt:	3 2 1 2	2 2 3 3 2.5	3 3 2 2 2.5	2 3 1 1.75	2 2 2 2 2 2 2	2 2 2 2 2 2 2	3 3 3 3 3 3	3 3 3 3 3		
CO1 CO2 CO3 CO4 Average Course C	3 2 3 3 2.75	2 1 2 1.75 nt:	3 2 1 2	2 2 3 3 2.5	3 3 2 2	2 3 1 1.75	2 2 2 2 2 2	2 2 2 2 2 2 2	3 3 3 3 3	3 3 3 3 3		
CO1 CO2 CO3 CO4 Average Course C	3 2 3 2.75 Conter Hours/V 0	2 1 2 1.75 nt: Week)	3 2 1 2	2 2 3 3 2.5	3 3 2 2 2.5 ours/We	2 3 1 1.75	2 2 2 2 2 2 2 P (Hours/W	2 2 2 2 2 2 2	3 3 3 3 3 Total Hour	3 3 3 3 3		
CO1 CO2 CO3 CO4 Average Course C L ()	3 2 3 2.75 Conter Hours/V 0	2 1 2 1.75 nt: Week)	3 2 1 2 2	2 2 3 3 2.5 T (He	3 3 2 2 2.5 0urs/Wo 0	2 3 1 1.75 eek)	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2 2 2 2 2 2 2 2 7 (eek)	3 3 3 3 3 Total Hour	3 3 3 3 3 /Week		
CO1 CO2 CO3 CO4 Average Course C L (1 Experime	3 2 3 2.75 Conter Hours/V 0	2 1 2 1.75 nt: Week)	3 2 1 2 2	2 2 3 2.5 T (He	3 3 2 2 2.5 0urs/Wo 0	2 3 1 1.75 eek)	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2 2 2 2 2 2 2 2 7 (eek)	3 3 3 3 3 Total Hour/ 2	3 3 3 3 3 /Week		
CO1 CO2 CO3 CO4 Average Course C L (1 Experime	3 2 3 2.75 Conter Hours/V 0	2 1 2 1.75 nt: Week)	3 2 1 2 2 alysis alyze)	2 2 3 3 2.5 T (He	3 3 2 2 2.5 0urs/We 0	2 3 1 1.75 eek)	2 2 2 2 2 2 2 P (Hours/W 2 Content lata (C2, U	2 2 2 2 2 2 7 (eek)	3 3 3 3 3 Total Hour/ 2	3 3 3 3 /Week		
CO1 CO2 CO3 CO4 Average Course C L (1 Experime 1.	3 2 3 2.75 Conter Hours/V 0	2 1 2 1.75 nt: Week)	3 2 1 2 2 2 nalysis nalyze) rroduct	2 2 3 3 2.5 T (He of traf	3 3 2 2 2.5 0 0 ffic su -layer s	2 3 1 1.75 eek) rvey d	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2 2 2 2 2 2 2 7 eek)	3         3         3         3         3         3         3         4         7         10         11         12         12         12         12         13	3 3 3 3 3 /Week		
CO1 CO2 CO3 CO4 Average Course C L (1 Experime 1.	3 2 3 2.75 Conter Hours/V 0	2 1 2 1.75 nt: Week) Ar Ar Ar Sin	3 2 1 2 2 2 nalysis nalyze) croduct ngle lay	2 2 3 3 2.5 T (He of traf	3 3 2 2 2.5 0urs/We 0 ffic su -layer s ysis us	2 3 1 1.75 eek) rvey d softwar	2       2       2       2       2       2       Content       lata (C2, U)       re (C1, Remeasing a softward)	2       2       2       2       2       2       2       2       inderstar       inderstar       enderstar	3         3         3         3         3         3         3         4         5         6         7         7         10         10         11         12         12         13         14         15         16         17         17         18         19         10         10         10         11         12         12         13         14         15         16         17         17         18         19         10         10         10         11         12         12         13         14         15         16         17         18         10         10         10         10	3         3         3         3         3         4)         reate)		
CO1 CO2 CO3 CO4 Average Course C L (1 Experime 1. 2. 3.	3 2 3 2.75 Conter Hours/V 0	2 1 2 1.75 nt: Week)	3 2 1 2 2 2 alysis alyze) croduct ngle lay ultilaye	2 2 3 3 2.5 T (He of traf	3 3 2 2 2.5 0urs/We 0 ffic su -layer s ysis usis	2 3 1 1.75 eek) rvey d softwar ing E-la g E-lay	2 2 2 2 2 2 2 P (Hours/W 2 Content lata (C2, U re (C1, Reme ayer software	2 2 2 2 2 2 2 7 eek) 6 nderstar 6 mber, C e (C4, A (C4, An	3           3	3         3         3         3         3         4)         reate)		
CO1 CO2 CO3 CO4 Average Course C L (1) Experime 1. 2. 3. 4. 5.	3 2 3 2.75 Conter Hours/V 0	2 1 2 1.75 nt: Week)	3 2 1 2 2 2 alysis alyze) croduct ngle lay ultilaye	2 2 3 3 2.5 T (He of traf	3 3 2 2 2.5 0urs/Wo 0 ffic su -layer s ysis usin TPAV	2 3 1 1.75 eek) rvey d softwar ing E-la g E-lay E softw	2         2         2         2         2         P (Hours/W         2         Content         lata (C2, U)         re (C1, Remeating the content of the content	2 2 2 2 2 2 7 2 2 7 2 2 7 2 2 7 2 7 2 7	3         3 <td< th=""><th>3         3         3         3         3         3         4)         reate)         bate)</th></td<>	3         3         3         3         3         3         4)         reate)         bate)		
CO1 CO2 CO3 CO4 Average Course C L (1 Experime 1. 2. 3. 4.	3 2 3 2.75 Conter Hours/V 0	2 1 2 1.75 nt: Week)	3 2 1 2 2 2 alysis alyze) croduct ngle lay ultilaye	2 3 3 2.5 T (He of traf	3 3 2 2 2.5 0urs/We 0 ffic su -layer s ysis usis sis usin TPAV sis of s	2 3 1 1.75 eek) rvey d softwar ing E-lay g E-lay g E-lay single la	2         2         2         2         2         P (Hours/W         2         Content         lata (C2, U)         re (C1, Remeating a construction of tware of	2 2 2 2 2 2 2 7 eek) anderstar ember, C e (C4, A (C4, Ana e (C2, U) paveme	3           3	3         3         3         3         3         3         4)         reate)         eate)		



Teaching - Learning Strategies	Contact Hours
Lecture	
Practical	22
Seminar/Journal Club	
Small group discussion (SGD)	
Self-directed learning (SDL) / Tutorial	
Problem Based Learning (PBL)	
Case/Project Based Learning (CBL)	8
Revision	
Others If any:	
Total Number of Contact Hours	30

#### **Assessment Methods:**

Formative	Summative
Viva-voce	Practical Examination & Viva-voce
Objective Structured Practical Examination	Objective Structured Practical Examination

## Mapping of Assessment with COs

Nature of Assessment	CO1	CO2	CO3	CO4
Quiz				
VIVA	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓
Assignment / Presentation				
Unit test				
Practical Log Book/ Record Book/Drawing	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓
Mid Semester Examination 1				
Mid Semester Examination 2				
University Examination(External Practical)	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓
				•
Feedback Process	2. Stu	ident's Fe	edback	
Students Feedback is taken through various s	-			
1. Regular feedback through Mentor Me	•			
<b>2.</b> Feedback between the semester throu	gh Goog	le forms		



			Facı	ılty of H	Engine	ering &	z Technolo	gy					
Name of th	ne Dep	artmen	nt	Civ	Civil Engineering								
Name of tl	ne Pro	gram		Ma	Master of Technology in Civil Engineering								
C C							ngineering	0	e				
Course Co	de			131	60237								
Course Tit	tle			Tra	affic L	ab							
Academic	Year			Ι									
Semester				II									
Number o	f Cred	its		1									
Course Pr	erequi	site		Hig	hway	Enginee	ering						
Course Synopsis					culation d study	n and fo , Driver	0	f (ADT, A	fic volume ADT, etc.), ad accident				
Course Ou At the end			student		abla f	0.							
CO1	fo					-	ce of traffic proper effi		d traffic ny transpor	t			
CO2	St	udents a	able to	understa	and tha	t how to	o determine	the speed	criteria				
CO3	A	ccidents	analys	sis and r	nitigat	ion							
CO4	Pa	rking st	tudies										
Mapping of Outcomes		rse Out	tcomes	(COs)	to Pro	gram O	outcomes (1	POs) & Pr	ogram Spe	cific			
COs	PO 1	PO2	PO 3	PO4	<b>PO</b> 5	PO6	PSO1	PSO2	PSO3	PSO 4			
CO1	3	2	3	2	3	2	2	2	3	3			
CO2	2	2	2	2	3	3	2	2	3	3			
CO3	3	2	2	3	2	2	2	2	3	3			
CO4	3	2	2	3	2	1	2	2	3	3			
Average	2.75	2	2.25	2.5	2.5	2	2	2	3	3			
Course Co	4												



	Λ		
	-	Т	

L (Hours/Week)		T (Hours/Week)	P (Hours/Week)	Total Hour/Week
0		0	2	2
Experiment No.	Content	I		
1.	Examine Analyze)		study using videogra	phy technique (C4,
2.	Examine Analyze)	1	idy using videograph	ny technique (C4,
3.	Investiga	te the Speed study b	y radar gun & endos	cope (C6, Create)
4.	Determir	ation of reaction tim	e of driver (C4, Ana	lyze)
5.	Examine	the Parking study (C	C4, Analyze)	
6.	Investiga	te the Accident inve	stigation study (C6,	Create)
7.	Examine Analyze)	• 1	vement of an accider	nt prone location (C4,

Teaching - Learning Strategies	Contact Hours	
Lecture		
Practical	22	
Seminar/Journal Club		
Small group discussion (SGD)		
Self-directed learning (SDL) / Tutorial		
Problem Based Learning (PBL)		
Case/Project Based Learning (CBL)	8	
Revision		
Others If any:		
Total Number of Contact Hours	30	

**Assessment Methods:** 



Formative	Summative
Viva-voce	Practical Examination & Viva-voce
Objective Structured Practical Examination	Objective Structured Practical Examination

Nature of Assessment	CO1	CO2	CO3	CO4
Quiz				
VIVA	✓	✓	<ul> <li>✓</li> </ul>	✓
Assignment / Presentation				
Unit test				
Practical Log Book/ Record	<b>√</b>	✓	✓	✓
Book/Drawing				
Mid Semester Examination 1				
Mid Semester Examination 2				
University Examination(External Practical)	•	•	•	✓ ✓
	_	•		
Feedback Process	1. St	udent's F	Feedback	
Students Feedback is taken through vario	us steps			
1. Regular feedback through Mentor	Mentee	system		
2. Feedback between the semester the	rough g	oogle for	rms	



# Master of Technology in Civil Engineering (Structural Engineering) 2<sup>nd</sup> Semester



		J	Facult	y of Er	iginee	ring &	Techno	logy		
Name of the	Depart				Engin					
Name of the	Progra	m		Master of Technology in Civil Engineering (Structural						
	U			Engineering)						
<b>Course Code</b>				13160214						
<b>Course Title</b>				Finit	e Elen	nent A	nalysis			
Academic Ye	ar			Ι			·			
Semester										
Number of C	redits			4						
<b>Course Prere</b>	equisite	)		Struc	ture ar	nalysis				
Course Syno	psis			Basic	es of	finite	element	analysis,	, study o	f different
				meth	ods lii	near eo	quations	and matr	ix method	, study by
							-			h as frame
				-				-		udy of Iso-
						elemen		i anaryono	, Duble 50	<i></i>
Course Outcomes:				Paral		CICIIICII	u.s.			
		reo etu	lonte u	rill bo	bla to					
CO1	the end of the course students wi						d atraga	strain mat		
		w the analysis procedure and the matrix operations.								
CO2				-			-	erations.		
CO3		the con	-	-						
Mapping of	Jourse	Unitcol	mes ( t	JUS) LO	) Progi	ram U	IITCOMOG		Program v	NACITIC
Outcomes:		outeo					utcomes	(105) <b>X</b>	i i ugi ani k	speeme
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
Outcomes:									_	_
Outcomes: COs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
Outcomes: COs CO1	PO1 1	PO2 -	PO3 3	PO4 3	PO5 3	PO6	PSO1	PSO2	PSO3 3	PSO4 3
Outcomes: COs CO1 CO2	PO1 1 1	PO2 -	PO3 3 3	PO4 3 3	PO5 3 3	PO6 3 3	PSO1 1 1	PSO2	PSO3 3 3	PSO4 3 3
Outcomes: COs CO1 CO2 CO3	PO1 1 1 1	PO2 - -	PO3 3 3 3	PO4 3 3 3	PO5 3 3 3 3	PO6 3 3 3	PSO1 1 1 1 1	PSO2 - - -	PSO3 3 3 3 3	PSO4 3 3 3 3
Outcomes: COs CO1 CO2 CO3 Average	PO1 1 1 1 1 1 1	PO2 - -	PO3 3 3 3	PO4 3 3 3	PO5 3 3 3 3	PO6 3 3 3	PSO1 1 1 1 1	PSO2 - - -	PSO3 3 3 3 3	PSO4 3 3 3 3
Outcomes: COs CO1 CO2 CO3 Average Course Con	PO1 1 1 1 1 1 1 ntent:	PO2 - - -	PO3 3 3 3 3 3	PO4 3 3 3 3	PO5 3 3 3 3 3	PO6 3 3 3 3	PSO1 1 1 1 1 1 1	PSO2 - - -	PSO3 3 3 3 3 3	PSO4 3 3 3 3 3
Outcomes: COs CO1 CO2 CO3 Average Course Con	PO1 1 1 1 1 1 1	PO2 - - -	PO3 3 3 3 3 3	PO4 3 3 3 3 T (Hou	PO5 3 3 3 3 3	PO6 3 3 3 3	PSO1 1 1 1 1 1 1	PSO2 - - -	PSO3 3 3 3 3 3	PSO4 3 3 3 3
Outcomes: COs CO1 CO2 CO3 Average Course Con L (Ho	PO1 1 1 1 1 1 urs/Wee	PO2 - - -	PO3 3 3 3 3 3	PO4 3 3 3 3 T (Hou	PO5 3 3 3 3 s	PO6 3 3 3 3 k)	PSO1 1 1 1 1 1 P (Hour	PSO2 - - - - - - - - - - - - -	PSO3 3 3 3 3 3	PSO4 3 3 3 3 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Outcomes: COs CO1 CO2 CO3 Average Course Con	PO1 1 1 1 1 1 urs/Wee	PO2 k)	PO3 3 3 3 3	PO4 3 3 3 3 T (Hou	PO5 3 3 3 3 3 urs/Wee 0	PO6 3 3 3 3 k)	PSO1 1 1 1 1 P (Hour Content	PSO2 - - - - s/Week)	PSO3 3 3 3 3 3 Total H	PSO4 3 3 3 3 3 6 00000000000000000000000000
Outcomes: COs CO1 CO2 CO3 Average Course Con L (Ho Unit	PO1 1 1 1 1 1 urs/Wee	PO2 k) Defin	PO3 3 3 3 3 4 6 6 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	PO4 3 3 3 3 T (Hou	PO5 3 3 3 3 ars/Wee 0 nent me	PO6 3 3 3 3 k) ethod (	PSO1 1 1 1 1 1 1 P (Hour Content C1, Ren	PSO2	PSO3 3 3 3 3 3 Total H Explain th	PSO4 3 3 3 3 Cour/Week 3 ne steps for
Outcomes: COs CO1 CO2 CO3 Average Course Con L (Ho Unit	PO1 1 1 1 1 1 urs/Wee	PO2 - - - k) Defin FEM	PO3 3 3 3 3 4 6 Finit (C2, U	PO4 3 3 3 3 T (Hou te elem	PO5 3 3 3 3 3 urs/Wee 0 ent mot tand) -	PO6 3 3 3 3 k) ethod ( - Discu	PSO1 1 1 1 1 1 P (Hour Content C1, Ren Iss stiffn	PSO2 - - - - - - - - - - - - -	PSO3 3 3 3 3 Total H Explain th d (C2, Un	PSO4 3 3 3 3 3 3 5 0ur/Week 3 ne steps for derstand) -
Outcomes: COs CO1 CO2 CO3 Average Course Con L (Ho Unit	PO1 1 1 1 1 1 urs/Wee	PO2 k) Defin FEM Demo	PO3 3 3 3 3 4 6 Finit (C2, U onstrate	PO4 3 3 3 T (Hou re elem Jnderst e Stres	PO5 3 3 3 3 urs/Wee 0 nent mo tand) – ss and	PO6 3 3 3 3 k) ethod ( - Discusstrain	PSO1 1 1 1 1 1 1 Content C1, Ren ss stiffn vectors	PSO2 - - - - - - - - - - - - -	PSO3 3 3 3 3 Total H Explain th d (C2, Un ply), Desc	PSO4 3 3 3 3 5 5 5 5 5 5 5 5 5 5 5 5 5
Outcomes: COs CO1 CO2 CO3 Average Course Con L (Ho Unit	PO1 1 1 1 1 1 urs/Wee	PO2 k) Defin FEM Demo displa	PO3 3 3 3 3 4 Constraints Cons	PO4 3 3 3 3 T (Hou te elem Underst e Stres at equa	PO5 3 3 3 3 3 ars/Wee 0 nent mo tand) - ss and tions (	PO6 3 3 3 k) ethod ( - Discustrain (C2, U	PSO1 1 1 1 1 1 1 Content Content C1, Ren ss stiffn vectors nderstan	PSO2 - - - - - - - - - - - - -	PSO3 3 3 3 3 3 Total H Explain th d (C2, Un ply), Desc n Linear of	PSO4 3 3 3 3 3 5 5 5 5 5 5 5 5 5 5 5 5 5
Outcomes: COs CO1 CO2 CO3 Average Course Con L (Ho Unit	PO1 1 1 1 1 1 urs/Wee	PO2 k) Defin FEM Demo displa equat	PO3 3 3 3 3 4 Constraints Cons	PO4 3 3 3 T (Hou te elem Jnderst e Stress at equa C2, U	PO5 3 3 3 3 urs/Wee 0 nent mo tand) s and tions ( ndersta	PO6 3 3 3 3 k) ethod ( - Discustrain (C2, U and) -	PSO1 1 1 1 1 1 1 Content Content Content Content Content Define	PSO2 - - - - - - - - - - - - -	PSO3 3 3 3 3 3 Total H Explain th d (C2, Un ply), Desc n Linear o stiffness n	PSO4 3 3 3 3 5 6 6 7 7 7 7 7 7 7 7 7 7 7 7 7
Outcomes: COs CO1 CO2 CO3 Average Course Con L (Ho Unit	PO1 1 1 1 1 1 urs/Wee	PO2 - - - - - - - - - - - - -	PO3 3 3 3 3 e Finit (C2, U onstrate icement ions (( mber))	PO4 3 3 3 T (Hou re elem Jnderst e Strest t equa C2, U – Desc	PO5 3 3 3 3 ars/Wee 0 ment montand) ss and tions ( ndersta cribe o	PO6 3 3 3 3 k) ethod ( - Discustrain (C2, U and) -	PSO1 1 1 1 1 1 1 Content Content Content Content Content Define	PSO2 - - - - - - - - - - - - -	PSO3 3 3 3 3 3 Total H Explain th d (C2, Un ply), Desc n Linear o stiffness n	PSO4 3 3 3 3 3 5 5 5 5 5 5 5 5 5 5 5 5 5
Outcomes: COs CO1 CO2 CO3 Average Course Con L (Ho Unit	PO1 1 1 1 1 1 urs/Wee	PO2 - - - k) Defin FEM Demo displa equat: Reme of bea	PO3 3 3 3 3 e Finit (C2, U onstrate ions (( mber)) ams (C	PO4 3 3 3 3 T (Hou re elem Jnderst e Stress at equa C2, U – Desc 4, Ana	PO5 3 3 3 3 and and) – and and) – and and and and and and and and	PO6         3         3         3         3         4         and)         -         verall	PSO1 1 1 1 1 1 P (Hour Content C1, Ren uss stiffn vectors nderstan Define load mat	PSO2 - - - - - - - - - - - - -	PSO3 3 3 3 3 3 Total H Explain th d (C2, Un ply), Desc n Linear o stiffness n nderstand)	PSO4 3 3 3 3 5 6 6 7 7 7 7 7 7 7 7 7 7 7 7 7



A+	

	an element (C2, Understand) - Identify various elements shapes (C2,
	Understand) - Define displacement polynomials (C1, Remember) -
	Discuss convergence requirements (C2, Understand) - Classify shape
	functions (C2, Understand) - Examine element strains and stresses (C4,
	Analyze) - Explain direct formulation of element stiffness matrix for
	beam element and plane truss element (C3, Understand)
3.	Examine the discretization of a body or structure (C4, Analyze) -
	Discuss the minimization of band width (C2, Understand) - State the
	steps for construction of stiffness matrix and loads for the assemblage
	(C1, Remember) - Classify the boundary conditions (C2, Understand)-
	Contrast analysis of plane truss, space truss, plane frame (C4, Analyze).
4.	Describe plane stress (C2, Understand) - Describe Plane strain (C2,
	Understand) - Identify CST, LST & QST elements (C2, Understand)

Teaching - Learning Strategies	Contact Hours	
Lecture	26	
Practical		
Seminar/Journal Club		
Small group discussion (SGD)		
Self-directed learning (SDL) / Tutorial	9	
Problem Based Learning (PBL)	6	
Case/Project Based Learning (CBL)		
Revision	4	
Others If any:		
Total Number of Contact Hours	45	

#### **Assessment Methods:**

Formative	Summative
Multiple Choice Questions (MCQ)	Mid Semester Examination 1
Viva-voce	Mid Semester Examination 2
<b>Objective Structured Practical Examination</b>	University Examination
Quiz	Dissertation
Seminars	Multiple Choice Questions (MCQ)
Problem Based Learning (PBL)	Short Answer Questions (SAQ)
Journal Club	Long Answer Question (LAQ)
	Practical Examination & Viva-voce
	Objective Structured Practical Examination

Nature of Assessment	CO1	CO2	CO3		



VIVA       Image: Second Book       Image: Second Book       Image: Second Book         Unit test       Image: Second Book       Image: Second Book       Image: Second Book         Mid Semester Examination 1       Image: Second Book       Image: Second Book       Image: Second Book         Mid Semester Examination 2       Image: Second Book       Image: Second Book       Image: Second Book       Image: Second Book         Mid Semester Examination 1       Image: Second Book       Image: Second Book       Image: Second Book       Image: Second Book         Mid Semester Examination 2       Image: Second Book       Image:	Quiz							
Init test       Image: State of the second matrix is	VIVA							
Practical Log Book/ Record Book       Image: Construction of the second book         Mid Semester Examination 1       Image: Construction of the second book         Mid Semester Examination 2       Image: Construction of the second book         Mid Semester Examination 2       Image: Construction of the second book         University Examination       Image: Construction of the second book         Feedback Process       2. Student's Feedback         Students Feedback is taken through various steps       1. Regular feedback through Mentor Mentee system         2. Feedback between the semester through google forms         References:         Text Books         1. C. S. Krishnamoorthy, (2008), Finite Element Analysis, Sec Edition, Tata McGraw Hill Education Pvt. Ltd., <i>ISBN-13: 9780074621</i> Reference Books         1. Cook R. D., Malkas D. S. & Plesha M. E, (2008), Concepts applications of Finite Element analysis, Fourth Edition, Wiley India Ltd., <i>ISBN-13: 9788126513369.</i> 2. Reddy, (2005), An Intro. To The Finite Element Methods, T Edition, Tata McGraw Hill Education Pvt. Ltd., <i>ISBN 9780070607415.</i>	Assignment / Presentation			✓	✓			
Mid Semester Examination 1       Image: Constraint of the semester Examination 2       Image: Constraint of the semester Examination 2         Mid Semester Examination 2       Image: Constraint of the semester Examination 2       Image: Constraint of the semester Examination 2         Image: Constraint of the semester Examination 2       Image: Constraint of the semester Examination 2       Image: Constraint of the semester Examination 2         Image: Constraint of the semester Examination 2       Image: Constraint of the semester Examination 2       Image: Constraint of the semester Examination 2         Image: Constraint of the semester Examination 2       Image: Constraint of the semester Examination 2       Image: Constraint of the semester Examination 2         Image: Constraint of the semester Examination 2       Image: Constraint of the semester Examination 2       Image: Constraint of the semester Examination 2         Image: Constraint of the semester Examination 2       Image: Constraint of the semester Examination 2       Image: Constraint of the semester Examination 2         Image: Constraint of the semester Examination 2       Image: Constraint of the semester Examination 2       Image: Constraint of the semester Examination 2         Image: Constraint of the semester Examination 2       Image: Constraint of the semester Examination 2       Image: Constraint of the semester Examination 2         Image: Constraint of the semester Examination 2       Image: Constraint of the semester 2       Image: Constraintexample a         Image: Con	Jnit test		<ul> <li>✓</li> </ul>	✓	<ul> <li>✓</li> </ul>			
Mid Semester Examination 1       1	Practical Log Bo	ok/ Record Book						
University Examination       ✓ <td>Mid Semester Ex</td> <td>amination 1</td> <td><ul> <li>✓</li> </ul></td> <td><ul> <li>✓</li> </ul></td> <td>✓</td> <td></td> <td></td> <td></td>	Mid Semester Ex	amination 1	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓			
Feedback Process       2. Student's Feedback         Students Feedback is taken through various steps       1. Regular feedback through Mentor Mentee system         2. Feedback between the semester through google forms         References:         Text Books         1. C. S. Krishnamoorthy, (2008), Finite Element Analysis, Sec Edition, Tata McGraw Hill Education Pvt. Ltd., <i>ISBN-13: 9780074621</i> Reference Books         1. Cook R. D., Malkas D. S. & Plesha M. E, (2008), Concepts applications of Finite Element analysis, Fourth Edition, Wiley India Ltd., <i>ISBN-13: 9788126513369</i> .         2. Reddy, (2005), An Intro. To The Finite Element Methods, T Edition, Tata McGraw Hill Education Pvt. Ltd., <i>ISBN 9780070607415</i> .	Mid Semester Ex	amination 2	✓	✓	✓			
Feedback Process       2. Student's Feedback         Students Feedback is taken through various steps       1. Regular feedback through Mentor Mentee system         2. Feedback between the semester through google forms         References:         Text Books         1. C. S. Krishnamoorthy, (2008), Finite Element Analysis, Sec         Edition, Tata McGraw Hill Education Pvt. Ltd., <i>ISBN-13: 9780074621</i> Reference Books         1. Cook R. D., Malkas D. S. & Plesha M. E, (2008), Concepts applications of Finite Element analysis, Fourth Edition, Wiley India Ltd., <i>ISBN-13:</i> 9788126513369.         2. Reddy, (2005), An Intro. To The Finite Element Methods, T Edition, Tata McGraw Hill Education Pvt. Ltd., <i>ISBN</i> 9780070607415.	Jniversity Exam	ination	✓	✓	✓			
Students Feedback is taken through various steps         1. Regular feedback through Mentor Mentee system         2. Feedback between the semester through google forms         References:         Text Books         1. C. S. Krishnamoorthy, (2008), Finite Element Analysis, Sec         Edition, Tata McGraw Hill Education Pvt. Ltd., ISBN-13: 9780074621         Reference Books         1. Cook R. D., Malkas D. S. & Plesha M. E, (2008), Concepts applications of Finite Element analysis, Fourth Edition, Wiley India Ltd., ISBN-13: 9788126513369.         2. Reddy, (2005), An Intro. To The Finite Element Methods, T Edition, Tata McGraw Hill Education Pvt. Ltd., ISBN 9780070607415.								
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<ul> <li>Edition, Tata McGraw Hill Education Pvt. Ltd., <i>ISBN-13: 9780074621</i></li> <li>Reference Books</li> <li>1. Cook R. D., Malkas D. S. &amp; Plesha M. E, (2008), Concepts applications of Finite Element analysis, Fourth Edition, Wiley India Ltd., <i>ISBN-13:</i> 9788126513369.</li> <li>2. Reddy, (2005), An Intro. To The Finite Element Methods, T Edition, Tata McGraw Hill Education Pvt. Ltd., <i>ISBN</i> 9780070607415.</li> </ul>	References:	Text Books						
<ul> <li>Edition, Tata McGraw Hill Education Pvt. Ltd., <i>ISBN-13: 9780074621</i></li> <li>Reference Books</li> <li>1. Cook R. D., Malkas D. S. &amp; Plesha M. E, (2008), Concepts applications of Finite Element analysis, Fourth Edition, Wiley India Ltd., <i>ISBN-13:</i> 9788126513369.</li> <li>2. Reddy, (2005), An Intro. To The Finite Element Methods, T Edition, Tata McGraw Hill Education Pvt. Ltd., <i>ISBN</i> 9780070607415.</li> </ul>			orthy, (	2008), F	inite El	ement A	Analysis,	Second
<ol> <li>Cook R. D., Malkas D. S. &amp; Plesha M. E, (2008), Concepts applications of Finite Element analysis, Fourth Edition, Wiley India Ltd., <i>ISBN-13</i>: 9788126513369.</li> <li>Reddy, (2005), An Intro. To The Finite Element Methods, T Edition, Tata McGraw Hill Education Pvt. Ltd., <i>ISBN</i> 9780070607415.</li> </ol>		Edition, Tata McGraw	Hill Ed	ucation P	vt. Ltd., J	ISBN-13.	978007	462100.
<ul> <li>applications of Finite Element analysis, Fourth Edition, Wiley India Ltd., <i>ISBN-13</i>: 9788126513369.</li> <li>2. Reddy, (2005), An Intro. To The Finite Element Methods, T Edition, Tata McGraw Hill Education Pvt. Ltd., <i>ISBN</i> 9780070607415.</li> </ul>		1. Cook R. D., Malkas D. S. & Plesha M. E, (2008), Concepts an						
Ltd., <i>ISBN-13</i> : 9788126513369. 2. Reddy, (2005), An Intro. To The Finite Element Methods, T Edition, Tata McGraw Hill Education Pvt. Ltd., <i>ISBN</i> 9780070607415.								*
2. Reddy, (2005), An Intro. To The Finite Element Methods, T Edition, Tata McGraw Hill Education Pvt. Ltd., ISBN 9780070607415.							ndia Pvt.	
Edition, Tata McGraw Hill Education Pvt. Ltd., ISBN 9780070607415.								
9780070607415.		• • • •						
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5. Singlesu S. Kao, (2010), the finite Element Method II Eligiliet			ר (10	The Finite	Flomen	t Metho	d in Eng	incoring
Fifth Edition, Elsevier Science, ISBN-13: 9780080952048.			, · ·				U	meeting,



Faculty of Engineering & Technology											
Name of the Department				Civil Engineering							
Name of the Program			Master of Technology in Civil Engineering (Structural								
8				Engineering)							
<b>Course Code</b>				1316		/					
Course Title						lastici	tv and	Plasticit	v		
Academic Ye	ar			I		iustici	ty und	1 Iusticit	-J		
Semester	ai			II							
Number of C	rodite			3							
Course Prere		<b>`</b>		Structure Mechanics							
Course Syno	-	/		Structural analysis is the determination of the effects of							
Course Syno	<b>P313</b>					•				components.	
					-					nclude all that	
										lges, vehicles,	
									0	rostheses and	
					gical tis		iic, at	, 5011	strata, p	rostneses and	
Course Outco	mes			01010	Siculti						
Course Outcomes: At the end of the course students will be able to:											
CO1						for ty	vo din	nensional	and three	e dimensional	
COI	-	Analyse the stresses and strains for two dimensional and three dimensional									
		ements.									
CO2		Understand the equilibrium and compatibility conditions.									
CO3		Solve the problems on Torsion for different shaped bars.									
CO4											
Mapping of Course Outcomes (COs) to Program Outcomes (POs) & Program Specific Outcomes:											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PS O1	PSO2	PSO3	PSO4	
CO1	1	-	3	3	3	3	1	-	3	3	
CO2	1	-	3	3	3	3	1	-	3	3	
CO3	1	-	3	3	3	3	1	-	3	3	
CO4	1	-	3	3	3	3	1	-	3	3	
Average	1	-	3	3	3	3	1	-	3	3	
	•			•				•			
Course Con	ntent:										
L (Hours/Week)				T (Hours/Week)			P (Hours/Week)		Total	Total Hour/Week	
3				0 0 3				3			
Unit						(	Conten	ıt			
1.		Exam	ine the	e analy	sis of S	tress a	nd Str	ain (C4, 1	Analyze)	- Describe the	
				•					-	ation of stress	
			• •	-						Understand) –	
					-					Examine Two	
1		Denn	u Gen	cranze	и поо	VC 2 19	iw (C	i, Keillel	110CI) - I	LAIIIIIE IWO	





	dimensional Problems in Cartesian Coordinates (C4, Analysis) - Examine Plane stress and plain strain problems with practical examples (C4, Analysis) - Discuss Equations of equilibrium and compatibility conditions in Cartesian coordinates (C2, Understand) – Define Airy's stress function (C1, Remember) - Design Bending of simply supported beams (C6, Create).
2	Examine Two dimensional Problems in Polar Coordinates (C4, Analysis) - Explain Equations of equilibrium and compatibility conditions in polar coordinates (C2, Understand) – Investigate Axi- symmetrical problems (C6, create) - Discuss Thick cylinder under uniform pressure (C2, Understand) - Examine Circular arc beams subjected to pure bending (C4, Analysis).
3	Examine Torsion of circular shafts (C4, Analysis), Explain St. Venant's Approach (C2, Understand), Discuss torsion of non-circular sections (C2, Understand), Define membrane analogy (C1, Remember), Design narrow rectangular cross-section (C6, Create).
4	Discuss Introduction to plasticity (C2, Understand) – Explain Stress – Strain diagram (C2, Understand) – Discuss Plastic analysis (C2, Understand) – State Yield criteria (C1, Remember) – Define St. Venant's theory (C1, Remember) – State Von Mises criterion (C1, Remember) – Define Plastic work (C1, Remember) –Describe Strain hardening (C2, Understand).

Teaching - Learning Strategies	Contact Hours				
Lecture	28				
Practical					
Seminar/Journal Club					
Small group discussion (SGD)					
Self-directed learning (SDL) / Tutorial	4				
Problem Based Learning (PBL)	9				
Case/Project Based Learning (CBL)					
Revision	4				
Others If any:					
Total Number of Contact Hours	45				



#### **Assessment Methods:**

Formative	Summative				
Multiple Choice Questions (MCQ)	Mid Semester Examination 1				
Viva-voce	Mid Semester Examination 2				
Objective Structured Practical Examination	University Examination				
Quiz	Dissertation				
Seminars	Multiple Choice Questions (MCQ)				
Problem Based Learning (PBL)	Short Answer Questions (SAQ)				
Journal Club	Long Answer Question (LAQ)				
	Practical Examination & Viva-voce				
	Objective Structured Practical Examination				

#### Mapping of Assessment with COs

Nature of Assessment	CO1	CO2	CO3	CO4			
Quiz							
VIVA							
Assignment / Presentation	✓	<ul> <li>✓</li> </ul>	✓	<ul> <li>✓</li> </ul>			
Unit test	•	<ul> <li>✓</li> </ul>	✓	✓			
Practical Log Book/ Record Book							
Mid Semester Examination 1	✓	<ul> <li>✓</li> </ul>	✓	<ul> <li>✓</li> </ul>			
Mid Semester Examination 2	•	<ul> <li>✓</li> </ul>	✓	<ul> <li>✓</li> </ul>			
University Examination	•	<ul> <li>✓</li> </ul>	✓	<ul> <li>✓</li> </ul>			
Feedback Process	2. Stu	2. Student's Feedback					

Students Feedback is taken through various steps

- 1. Regular feedback through Mentor Mentee system
- 2. Feedback between the semester through google forms

References:Text Books1. Timoshenko and Goodier, (1970), Theory of Elasticity, Third<br/>Edition, McGraw Hill Professional, ISBN-13: 9780070858053.Reference Books1. Srinath, (2002), Advanced Mechanics of Solids, Third Edition,<br/>Tata McGraw Hill Pvt. Ltd., ISBN-13: 9780070139886.2. D. Peric, E. A. de Souza Neto & D. R. J. Owen, (2011),<br/>Computational Methods for Plasticity, Wiley, ISBN-13:<br/>9781119964544.



			Facul	ty of Eng	gineer	ing & T	<b>Fechnol</b>	)gv				
Name of the	Civil Engineering											
Name of the Program					Master of Technology in Civil Engineering (Structural							
				Engine		-		U	UX			
<b>Course Code</b>				131602	U,							
Course Title					Limit State Design of Steel Structures							
Academic Ye	ar			I								
Semester				II								
Number of C	4											
Course Prere	Design of Steel Structure											
Course Synopsis				Many civil engineering structures are made up of steel.								
				•		0	e			structures is		
					-	-	-		-			
				-	-			-		er to make		
									e	span. Limit		
					-	-			-	orldwide for		
				design	design of steel structures and its various components. Also							
				precise	and	correc	t detaili	ng of	structural	drawing is		
				necess	ary in	order to	o get the	correct	behavior	of structures		
				and leads to smooth construction of structures. This course								
				will pr	will provide detailed knowledge of design and detailing of							
				steel structures as per Indian standards.								
Course Outco				such structures as per mutan standards.								
At the end of		irea etu	donta	will be al	ala to:							
CO1				compressi		nhers						
CO1 CO2	-			ucture us			ign met	hod				
CO2 CO3	_			e steel str			sign meu	liou				
	-					5.						
CO4				and roof the			4		D	. C		
Mapping of (	Course	Outco	omes (	COs) to	Progra	am Ou	tcomes (	POs) &	rogran	n Specific		
Outcomes:												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4		
<u>CO1</u>	1		2	2	2	2	1		2			
CO1	1	-	3	3	3	3	1	-	3	3		
CO2	1	-	3	3	3	3	1	-	3	3		
<u>CO3</u>	1	-	3	3	3	3	1	-	3	3		
<u>CO4</u>	1	-	3	3	3	3	1	-	3	3		
Average	1	-	3	3	3	3	1	-	3	3		
Course Content:												
				Т				P (Hours/Wester)		Total Hour/Week		
							Total					
TI	3											
Unit				Content								



NAAC A+	

1	Describe Tension member, net and effective area (C2, Understand),
1	design of tension members (C6, Create), Define Compression member
	(C1, Remember), Design of compression members (C6, Create), Discuss
	built up compression member (C2, Understand), Design of lacing and
	batten (C6, Create), Describe column base (C2, Understand), Examine
	the types of column base (C4, Analyze), Design of base slab (C6, Create).
2	
2	Introduction, Explain Shape factors (C2, Understand), Define load factor
	(C1, Remember), Discuss Plastic hinge (C2, Understand), Define length
	of plastic hinge (C1, Remember), Examine Mechanisms and types of
	mechanism (C4, Analyze), Define Theorem of plastic analysis (C1,
	Remember), Examine the Analysis of beams and portal frames (C4,
	Analyze).
3	Design of Light Gauge Steel Structures (C6, Create) - Differentiate the
	Types of cross sections (C4, Analyze) - Define Local buckling and
	lateral buckling (C1, Remember) - Design of compression and tension
	members (C6, Create) – Discuss Beams (C2, Understand) - Explain
	Deflection of beams (C2, Understand).
4	Discuss General consideration (C2, Understand), Describe Flexural
	strength (C2, Understand), Explain shear strength of web (C2,
	Understand), Explain stiffeners and their types (C2, Understand), design
	of plate girder with and without stiffeners (C6, Create).
	Introduction, Differentiate the types of roof truss (C4, Analyze),
	Describe spacing of truss (C2, Understand), Discuss loads on roof truss
	(C2, Understand), Examine the analysis of roof truss (C4, Analyze).

Teaching - Learning Strategies	Contact Hours	
Lecture	30	
Practical		
Seminar/Journal Club		
Small group discussion (SGD)		
Self-directed learning (SDL) / Tutorial	12	
Problem Based Learning (PBL)	15	
Case/Project Based Learning (CBL)		
Revision	3	
Others If any:		
Total Number of Contact Hours	60	

# **Assessment Methods:**

Formative	Summative
Multiple Choice Questions (MCQ)	Mid Semester Examination 1



Viva-voce	Mid Semester Examination 2
Objective Structured Practical Examination	University Examination
Quiz	Dissertation
Seminars	Multiple Choice Questions (MCQ)
Problem Based Learning (PBL)	Short Answer Questions (SAQ)
Journal Club	Long Answer Question (LAQ)
	Practical Examination & Viva-voce
	Objective Structured Practical Examination

Nature of Assessn	nent	CO1	CO2	CO3	CO4		
Quiz							
VIVA		✓	✓				
Assignment / Prese	entation	✓	✓	✓	<ul> <li>✓</li> </ul>		
Unit test		✓	✓	✓	✓		
Practical Log Book	k/ Record Book						
Mid Semester Exam	mination 1	✓	✓	✓	<ul> <li>✓</li> </ul>		
Mid Semester Exam	mination 2	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓		
University Examin	ation	✓	✓	✓	✓		
					1 1		
Feedback Process		2. Stu	dent's Fe	edback			
	is taken through various	-					
Ū.	back through Mentor Me tween the semester through	•					
References:							
	Text Books						
	1. Dayarathnam. P., (19	96), Des	ign of Ste	el Struct	ures, Seco	ond Edi	tion, S.
	Chand and Publishers, I	SBN-13:	0788121	923200.			
	Reference Books						
	1. Duggal S. K., (2014), Limit State Design of Steel Structures, Second						
	Edition, McGraw Hill, ISBN-13: 9789351343509.						
	2. Ramchandra, Virendra Gehlot, (2010), Limit State Design of Steel						
	Structures: Based on IS	S: 800-2	007 IN S	. I. Unit	s, Scienti	fic Pub	lishers,
	ISBN-13: 97881723361	41.					



Faculty of Engineering & Technology										
Name of the Department					Civil Engineering					
Name of the Program					Master of Technology (Civil Engineering) with Structural Engineering					
<b>Course Code</b>	)									
<b>Course Title</b>				Earth	nquake R	esistan	t Design			
Academic Year										
Semester				II						
Number of C	redits			3						
<b>Course Prere</b>	equisite	9		Struc	tural Dy	namics				
Course Syno	psis			The	course a	ims to	present	to the s	students	s fundamental
							ent seisi			nd technical
					-					or the seismic
										their seismic
				-		uctures	and the	evalua	uon ol	
response.										
Course Outc			1 .	.11 1	11 .					
At the end of						1	1 .	1 1'		
CO1							r dynami			
CO2							ant design		ctures	
CO3							ductile de	etailing		
CO4					trofitting				_	
Mapping of Outcomes:	Course	Outco	mes (	COs) to	) Progra	m Out	comes (P	'Os) & 1	Progra	m Specific
COs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	1	-	3	3	3	3	3	3	3	3
CO2	1	-	3	3	3	3	-	-	-	-
CO3	1	-	3	3	3	3	3	3	3	3
CO4	1	-	3	3	3	3	3	3	3	3
Average	1	-	3	3	3	3	3	3	3	3
Course Co	ntonte									
		J-)		Т	ma/(X7 a al-)	Т	) (11,0/1)	Week)	Tota	Hour/Wook
	L (Hours/Week)T (Hours/Week)P (Hours/Week)Total Hour/Week3003					1 Hour/ week				
Unit	v				5		ontent		<u>I</u>	~
2.		Defin	ition o	of differ	ent elem		Seismolo	ogy (C1	. Reme	mber).
										e general
		-		-		•	gions and	•		-
		Under			2 01 0010			20151110	0 P - 15	(- <b>-</b> ,



	Describe Philosophy of earthquake resistant design (C2, Understand), Differentiate between earthquake proof v/s earthquake resistant design (C4, Analyze), Compare the four virtues of earthquake resistant structures (strength, stiffness, ductility and configuration) (C4, Analyze), Investigate the different seismic structural configuration (C6, Create)
2.	<ul> <li>Define seismic load (C1, Remember), Describe Seismic Coefficient Method (C2, Understand), and evaluation of base shear and its distribution along height (C5, Evaluate). Explain Response spectrum (C2, Understand), value of IS code provisions during the design of structures (C5, Evaluate)</li> <li>Capacity Based design- an approach for earthquake resistant design of soft storey RC Building (C6, Create), Design of Earthquake resistant structure (C6, Create), Seismic analysis of RC building as per IS:1893 code (C4, Analyze)</li> </ul>
3.	Describe the concepts of Ductile Detailing of various structural components as per IS: 13920 provisions in earthquake resistant structure (C2, Understand), Investigate the strong Column weak beam concept (C6, Create)
4.	Describe irregularity (C2, Understand), Differentiate the types of irregularity (C4, Analyze), compare effect of structural irregularities on the performance of structure (C4, Analyze), Investigate the seismic evaluation and retrofitting, techniques used for the retrofitting of RC and masonry structures (C6, Create)

<b>Teaching - Learning Strategies</b>	Contact Hours	
Lecture	20	
Practical		
Seminar/Journal Club	3	
Small group discussion (SGD)	3	
Self-directed learning (SDL) / Tutorial	12	
Problem Based Learning (PBL)	3	
Case/Project Based Learning (CBL)		
Revision	4	
Others If any:		
Total Number of Contact Hours	45	

### **Assessment Methods:**

Formative	Summative
Multiple Choice Questions (MCQ)	Mid Semester Examination 1
Viva-voce	Mid Semester Examination 2
Objective Structured Practical Examination	University Examination



Quiz	Dissertation
Seminars	Multiple Choice Questions (MCQ)
Problem Based Learning (PBL)	Short Answer Questions (SAQ)
Journal Club	Long Answer Question (LAQ)
	Practical Examination & Viva-voce
	Objective Structured Practical Examination

# Mapping of Assessment with COs

Nature of Assess	ment	CO1	CO2	CO3	CO4		
Quiz							
VIVA							
Assignment / Pres	sentation	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>		
Unit test		<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓		
Practical Log Boo	ok/ Record Book						-
Mid Semester Ex	amination 1	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>		
Mid Semester Ex	amination 2	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>		
University Exami	nation	✓	<ul> <li>✓</li> </ul>	<b>√</b>	<b>√</b>		
3. Regular fe	k is taken through various eedback through Mentor N between the semester through	Mentee sy					
References:	References:       (List of books)         TEXT BOOKS       1. Anil K. Chopra, (2011), Dynamics of Structures - Theory and Applications to Earthquake Engineering, Second Edition, Ingram International Inc., ISBN-13: 9780132858038.         REFERENCE BOOKS       1. Pankaj Agarwal and Manish Shrikhande, (2007), Earthquake Resistant Design of Structures, First Edition, Prentice-Hall India Pvt Ltd, ISBN-13: 9788120328921.         2. Gupta B. L., (2010), Principles of Earthquake Resistant Design of Structures & Tsunami, Standard Publishers & Distributors, ISBN-13: 9788180141485.						

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		]	Facult	v of Er	ginee	ring &	z Techno	logv		
Name of the	Depa			1	Engin			- 81		
Name of the	-				Master of Technology in Civil Engineering (Structural					
					neering		05	0	U	`
<b>Course Code</b>				1316						
<b>Course Title</b>				Finit	e Elen	nent A	nalysis I	Lab		
Academic Ye	ar			Ι			J			
Semester II										
Number of C	redit	S		3						
<b>Course Prere</b>	quisi	te		Struc	tural A	Analys	is			
Course Syno								analysi	s, stud	y of different
· · ·	•			meth	ods lii	near e	quations	and mat	trix met	thod, study by
							-			such as frame
				-				-		c study of Iso-
					netric (	•		it unurys!	, <b>D</b> ash	5. 5. 6. 150 <sup>-</sup>
Course Outc				Paral		CICILIEI				
At the end of			lantar	vill be c	hla to					
CO1							stress-strai	in motrix		
CO1 CO2							natrix ope			
		w the con	•	-			-			
CO3										
CO4 Monning of (				±			element		Dugan	m Cnasifia
Mapping of Outcomes:	Jours	e Outco	mes (	COS(10)	Prog		Jucomes	(PUS) a	rogra	am specific
COs	PO	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
003	1	10-	100	101	100	100	1501	1502	1500	1501
CO1	1	-	3	3	3	3	1	-	3	3
CO2	1	-	3	3	3	3	1	-	3	3
CO3	1	-	3	3	3	3	1	-	3	3
CO4	1	-	3	3	3	3	1	-	3	3
Average	1	-	3	3	3	3	1	-	3	3
<b>Course Con</b>	ntent	•								
L (Ho	urs/W	eek)		T (Hou	rs/Wee	k)	P (Hours	s/Week)	Tota	l Hour/Week
``````````````````````````````````````	0	,			0		2			2
Experiment						Co	ontent		•	
No.										
1	An	alysis of	three-	span co	ontinuo	us bea	ums (C4, .	Analyze)		
2	An	alysis of	propp	ed cant	ilever	beam (	C4, Anal	lyze)		
3	An	alysis of	statica	ally dete	ermina	te plar	ne truss (	C4, Analy	yze)	
4	A	Analysis of statically determinate plane truss (C4, Analyze) Analysis of statically indeterminate plane truss (C4, Analyze)								
5	An	alysis of	statica	ally inde	etermi	nate pl	ane truss	(C4, Ana	alyze)	



Contact Hours
18
12
30

<b>Assessment Methods</b>	:
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Formative	Summative
Multiple Choice Questions (MCQ)	Mid Semester Examination 1
Viva-voce	Mid Semester Examination 2
<b>Objective Structured Practical Examination</b>	University Examination
Quiz	Dissertation
Seminars	Multiple Choice Questions (MCQ)
Problem Based Learning (PBL)	Short Answer Questions (SAQ)
Journal Club	Long Answer Question (LAQ)
	Practical Examination & Viva-voce
	Objective Structured Practical Examination

Nature of Assessment	CO1	CO2	CO3	<b>CO4</b>				
Quiz								
VIVA	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓				
Unit test								
Practical Log Book/ Record Book	✓	<ul> <li>✓</li> </ul>	✓	✓				
Demonstration	✓	<ul> <li>✓</li> </ul>	✓	✓				
Mid Semester Examination 1								
Mid Semester Examination 2								
University Examination(External Practical)	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓	<ul> <li>✓</li> </ul>			
Feedback Process	2. Student's Feedback							
Students Feedback is taken through various 1. Regular feedback through Mentor M	-	stem						



# 2. Feedback between the semester through google forms

		I	Facult	v of Er	iginee	ring &	z Techno	logv		
Name of the	Depart				Civil Engineering					
Name of the	<b>.</b>			Master of Technology in Civil Engineering (Structural						
					neering		- 07	2	0	
<b>Course Code</b>				0	0218					
Course Title			Engin	eering L	aborate	orv				
Academic Ye	I			8-						
Semester	II									
Number of C	redits			2						
Course Prere		<u>,</u>		Conc	rete T	echnol	ogv			
Course Syno	-	-					<u> </u>	is to r	present t	o the students
000000055005	P <sup>515</sup>							-		nic codes and
										al skills for the
										uation of their
					nic resp					
<b>Course Outc</b>	omes:					-				
At the end of	the cou	rse stuc	lents	will be a	able to	:				
CO1	Desig	gn conci	rete m	ix for p	articul	ar grac	de of conc	crete		
CO2							g condition			
CO3	Perfo	rm non-	-destr	uctive to	esting.		-			
CO3Perform non-destructive testing.Mapping of Course Outcomes (COs) to Program Outcomes (POs) & Program Specific										
	Course	Outco	mes (	COs) to	Prog	ram O	outcomes	(POs)	& Progra	am Specific
<b>Outcomes:</b>		-				_				-
	Course	Outcom PO2	mes ( PO3	COs) to PO4	Prog	ram O PO6	Putcomes PSO1	(POs)	& Progra	am Specific PSO4
<b>Outcomes:</b>		-				_				-
Outcomes: COs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
Outcomes: COs CO1	PO1 1	PO2	PO3 3	PO4 3	PO5 3	PO6 3	PSO1	PSO2 1	PSO3 3	PSO4 3
Outcomes: COs CO1 CO2	PO1 1 1	PO2 1 1	PO3 3 3	PO4 3 3	PO5 3 3	PO6 3 3	PSO1 1 1	PSO2 1 1	PSO3 3 3	PSO4 3 3
Outcomes: COs CO1 CO2 CO3	PO1 1 1 1	PO2 1 1 1 1	PO3 3 3 3	PO4 3 3 3	PO5 3 3 3	PO6 3 3 3	PSO1 1 1 1 1	PSO2 1 1 1 1	PSO3 3 3 3 3	PSO4 3 3 3
Outcomes: COs CO1 CO2 CO3	PO1 1 1 1 1 1 1	PO2 1 1 1 1	PO3 3 3 3	PO4 3 3 3	PO5 3 3 3	PO6 3 3 3	PSO1 1 1 1 1	PSO2 1 1 1 1	PSO3 3 3 3 3	PSO4 3 3 3
Outcomes: COs CO1 CO2 CO3 Average Course Con	PO1 1 1 1 1 1 1 ntent:	PO2 1 1 1 1 1 1	PO3 3 3 3	PO4 3 3 3 3 3	PO5 3 3 3 3 3	PO6 3 3 3 3 3	PSO1 1 1 1 1	PSO2 1 1 1 1 1 1	PSO3 3 3 3 3 3	PSO4 3 3 3
Outcomes: COs CO1 CO2 CO3 Average Course Con	PO1 1 1 1 1 1 1	PO2 1 1 1 1 1 1	PO3 3 3 3	PO4 3 3 3	PO5 3 3 3 3 3	PO6 3 3 3 3 3	PSO1 1 1 1 1 1 1	PSO2 1 1 1 1 1 1	PSO3 3 3 3 3 3	PSO4 3 3 3 3 3
Outcomes: COs CO1 CO2 CO3 Average Course Con	PO1 1 1 1 1 1 ntent: urs/Wee	PO2 1 1 1 1 1 1	PO3 3 3 3	PO4 3 3 3 3 3	PO5 3 3 3 3	PO6 3 3 3 3 3	PSO1 1 1 1 1 1 1	PSO2 1 1 1 1 1 1	PSO3 3 3 3 3 3	PSO4 3 3 3 3 3 I Hour/Week
Outcomes: COs CO1 CO2 CO3 Average Course Con L (Ho	PO1 1 1 1 1 1 ntent: urs/Wee	PO2 1 1 1 1 1 k)	PO3 3 3 3 3	PO4 3 3 3 3 T (Hou	PO5 3 3 3 3 3 rs/Wee 0	PO6 3 3 3 3 k)	PSO1 1 1 1 1 1 1 P (Hours 2 Content	PSO2 1 1 1 1	PSO3 3 3 3 3 Tota	PSO4 3 3 3 3 3 I Hour/Week
Outcomes: COs CO1 CO2 CO3 Average Course Con L (Ho	PO1 1 1 1 1 1 ntent: urs/Wee	PO2 1 1 1 1 1 k) To tes cube s	PO3 3 3 3 3 st the specir	PO4 3 3 3 3 T (Hou	PO5 3 3 3 3 3 rs/Wee 0 ssive s 4, Ana	PO6 3 3 3 3 k) trength lyze)	PSO1 1 1 1 1 1 1 P (Hours 2 Content n of fibre	PSO2 1 1 1 1 1 s/Week) reinforc	PSO3 3 3 3 3 Tota	PSO4 3 3 3 3 4 Hour/Week 2 rete by testing
Outcomes: COs CO1 CO2 CO3 Average Course Con L (Ho	PO1 1 1 1 1 1 ntent: urs/Wee	PO2 1 1 1 1 1 k) To tes cube s	PO3 3 3 3 3 st the specir	PO4 3 3 3 3 T (Hou	PO5 3 3 3 3 3 rs/Wee 0 ssive s 4, Ana	PO6 3 3 3 3 k) trength lyze)	PSO1 1 1 1 1 1 1 P (Hours 2 Content n of fibre	PSO2 1 1 1 1 1 s/Week) reinforc	PSO3 3 3 3 3 Tota	PSO4 3 3 3 3 4 Hour/Week 2
Outcomes: COs CO1 CO2 CO3 Average Course Con L (Ho Experiment 1.	PO1 1 1 1 1 1 ntent: urs/Wee	PO2 1 1 1 1 1 1 k) To tes cube s Castin (C4, 4)	PO3 3 3 3 3 3 st the specimer of the specimer	PO4 3 3 3 3 T (Hour compress nens (C testing ze)	PO5 3 3 3 3 3 3 ssive s 4, Ana 5 of sin	PO6 3 3 3 3 k) trength lyze) nply su	PSO1 1 1 1 1 1 1 P (Hours 2 Content n of fibre	PSO2 1 1 1 1 1 s/Week) reinforc	PSO3 3 3 3 3 3 Tota ced concr ams for f	PSO4 3 3 3 3 3 H Hour/Week 2 rete by testing flexural failure
Outcomes: COs CO1 CO2 CO3 Average Course Con L (Ho Experiment 1.	PO1 1 1 1 1 1 ntent: urs/Wee	PO2 1 1 1 1 1 1 k) To tes cube s Castin (C4, 4)	PO3 3 3 3 3 3 st the specimer of the specimer	PO4 3 3 3 3 T (Hour compress nens (C testing ze)	PO5 3 3 3 3 3 3 ssive s 4, Ana 5 of sin	PO6 3 3 3 3 k) trength lyze) nply su	PSO1 1 1 1 1 1 1 P (Hours 2 Content n of fibre	PSO2 1 1 1 1 1 s/Week) reinforc	PSO3 3 3 3 3 3 Tota ced concr ams for f	PSO4 3 3 3 3 4 Hour/Week 2 rete by testing
Outcomes: COs CO1 CO2 CO3 Average Course Con L (Ho Experiment 1. 2.	PO1 1 1 1 1 1 ntent: urs/Wee	PO2 1 1 1 1 1 1 1 k) To tes cube s Castir (C4, 4 Castir (C4, 4)	PO3 3 3 3 3 3 3 st the specin and analyzing	PO4 3 3 3 3 3 T (Hou compres nens (C testing ze) l testing ze)	PO5 3 3 3 3 3 3 ssive s 4, Ana 5 of sin 5 of sin	PO6 3 3 3 3 4 k) trength lyze) nply su	PSO1 1 1 1 1 1 1 P (Hours 2 Content n of fibre upported I upported I	PSO2 1 1 1 1 1	PSO3 3 3 3 3 3 Tota ced concr ams for f ams for s	PSO4 3 3 3 3 3 4 Hour/Week 2 rete by testing flexural failure shear failure
Outcomes: COs CO1 CO2 CO3 Average Course Con L (Ho Experiment 1. 2.	PO1 1 1 1 1 1 ntent: urs/Wee	PO2 1 1 1 1 1 1 1 k) To tes cube s Castir (C4, 4 Castir (C4, 4)	PO3 3 3 3 3 3 3 st the specin and analyzing	PO4 3 3 3 3 3 T (Hou compres nens (C testing ze) l testing ze)	PO5 3 3 3 3 3 3 ssive s 4, Ana 5 of sin 5 of sin	PO6 3 3 3 3 4 k) trength lyze) nply su	PSO1 1 1 1 1 1 1 P (Hours 2 Content n of fibre	PSO2 1 1 1 1 1	PSO3 3 3 3 3 3 Tota ced concr ams for f ams for s	PSO4 3 3 3 3 3 4 Hour/Week 2 rete by testing flexural failure shear failure



6.	To test bending test of I-section steel beam (C4, Analyze)
7.	To conduct bending test of steel channel section (C4, Analyze)
8.	To test rebound hammer test on concrete blocks (C4, Analyze)
9.	To test ultrasonic pulse velocity test (C4, Analyze)

Teaching - Learning Strategies	Contact Hours
Lecture	
Practical	11
Seminar/Journal Club	
Small group discussion (SGD)	
Self-directed learning (SDL) / Tutorial	
Problem Based Learning (PBL)	8
Case/Project Based Learning (CBL)	11
Revision	
Others If any:	
Total Number of Contact Hours	30

## **Assessment Methods:**

Formative	Summative
Multiple Choice Questions (MCQ)	Mid Semester Examination 1
Viva-voce	Mid Semester Examination 2
Objective Structured Practical Examination	University Examination
Quiz	Dissertation
Seminars	Multiple Choice Questions (MCQ)
Problem Based Learning (PBL)	Short Answer Questions (SAQ)
Journal Club	Long Answer Question (LAQ)
	Practical Examination & Viva-voce
	Objective Structured Practical Examination

Nature of Assessment	CO1	CO2	CO3		
Quiz					
VIVA	✓	✓	✓		
Assignment / Presentation					
Unit test					
Practical Log Book/ Record Book/Drawing	✓	✓	✓		
Mid Semester Examination 1					
Mid Semester Examination 2					



University Examination (External	✓	✓	✓						
Practical)									
		·							
Feedback Process	1	. Student'	's Feedba	ck					
Students Feedback is taken through vario	Students Feedback is taken through various steps								
1. Regular feedback through Mentor Men	1. Regular feedback through Mentor Mentee system								
2. Feedback between the semester through	2. Feedback between the semester through google forms								



# Master of Technology in Civil Engineering (Remote Sensing and GIS) 2<sup>nd</sup> Semester



			Fac	ulty of	Engine	ering &	Technolo	ogy			
Name of t	he Depar	tment		Civil	Engine	eering					
Name of t	he Progra	am		Master of Technology in Civil Engineering (Remote Sensing and							
				GIS)							
Course Co	ode			1316	60240						
Course Ti	tle			Geos	spatial 2	Data Pro	ocessing a	nd Model	ling		
Academic	Year			I							
Semester	Semester II										
Number o	of Credits			4							
Course Pr	rerequisit	e		NIL							
Course Sy	nopsis			Inter	polation	n, Geo-	statistical	Method,	DTM ap	plication, GIS	
				mode	els, prog	gramming	g tools				
Course O											
At the end				ll be ab	le to:						
CO1 Ap	ply advan	ced GIS	tools								
CO2 Pre	pare GIS	data for	various	elevati	on mod	els					
CO3 Sol	lve geospa	tial prob	lems us	sing pro	gramm	ing tools					
CO4 An	alyze GIS	data usi	ng com	plex ge	ospatial	l models					
Mapping	of Course	Outcon	nes (CC	)s) to P	rogran	n Outcor	nes (POs)	) & Progra	ım Specifi	ic Outcomes:	
COs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	
CO1	3	2	1	2	-	-	-	-	1	1	
CO2	3	3	1	2	-	-	-	-	1	1	
CO3	3	3	1	2	-	-	-	-	1	1	
CO4	3	2	1	2	-	-	-	-	1	1	
Average	3	1.75	1	2	-	-	-	-	1	1	
Course Co	ontent:	<u>    I                                </u>	1	L	1	1	1	1	1	<b>I</b>	
L	Т	(Hours/	Week)			Р		CL		Hour/Week	
(Hours/					(Hour	s/Week)	(Ноц	rs/Week)			
Week)					(	· · · ·)	(				
WCCK)											



3	- 3 3										
Unit	Content and Competency										
1	Local and Global methods of Interpolation C1 (Remember). Explain method of undetermined coefficients and method of variation of parameters. C2 (Understand)										
2	Slope and aspect and site selection studies C2 (Understand)view shed and watershed analysis. C1 (Remember)Working with Open Source DEM's. C6 (Create)	view shed and watershed analysis. C1 (Remember)									
3	Modelling Process. C2 (Understand)Classification; Model builder tools. C6 (Create)Python, R programming and MATLAB concepts for geo-processing tools. C6 (Create)	;)									
4	Components, Data Sources Free and open source GIS software and applications										

Learning Strategies	Contact Hours	
Lecture	32	
Practical		
Seminar/Journal Club	2	
Small group discussion (SGD)	2	
Self-directed learning (SDL) / Tutorial	16	
Problem Based Learning (PBL)	2	
Case/Project Based Learning (CBL)	2	
Revision	4	
Others If any:		
Total Number of Contact Hours	60	



Formative	Summative
Multiple Choice Questions (MCQ)	Mid Semester Examination 1
Quiz	Mid Semester Examination 2
Seminars	University Examination
Problem Based Learning (PBL)	Short Answer Questions (SAQ)
Journal Club	Long Answer Question (LAQ)

Nature of Assessment	CO1	CO2	CO3	CO4
Quiz	✓	✓	<ul> <li>✓</li> </ul>	✓
Assignment / Presentation	✓	✓	✓	<ul> <li>✓</li> </ul>
Unit test	✓	✓	✓	✓
Mid Semester Examination 1	✓	✓	✓	✓
Mid Semester Examination 2	✓	✓	✓	✓
University Examination	•	✓	✓	✓
	·		÷	
Feedback Process	1. Stude	ent's Feedba	ck	

<b>References:</b>	Textbooks:
	1. Principles of GIS for Land Resource Assessment, Burrough, P.A., Oxford Pub., 2005.
	2. Concepts and Techniques of Geographic Information Systems, C.P .Lo &
	Albert K.W. Yeung, second Edition, Prentice Hall India Pvt. Ltd,2016.
	3. Remote Sensing and Image Interpretation, Lilles T. Mand Kiefer R.W., John Wiley, 2015
	Reference Books:
	1. Remote Sensing Imagery, Florence Tupin, Jordi Inglada and Jean-Marie
	Nicolas, ISTE and Wiley, 2014
	2. Principles of GIS for Land Resource Assessment, Burrough, P.A., Oxford
	Publications, 2005.



				Facult	y of Eng	gineerin	g & Tech	nology					
Name of	the De	epartm	ent	Civ	Civil Engineering								
Name of the Program					Master of Technology in Civil Engineering (Remote Sensing and								
					5)								
Course	Code			131	60241								
Course Title					ellite In	nage Pro	cessing						
Academic Year					Ι								
Semester													
Number of Credits				3									
Course l	Prereq	uisite		NII									
Course S	Synops	is		Dat	ta produ	cts, digita	al image f	ormation, enl	nanceme	ent, and			
				pro	cessing,	, segment	ation, ima	nge classificat	ion tech	iniques			
Course (	Outcon	nes:		I									
At the en	nd of the	e course	e studer	nts will	be able	to:							
CO1	Anal	yze ren	note sen	sing da	ta using	, image p	rocessing	techniques.					
CO2	Class	Analyze remote sensing data using image processing techniques. Classify the remote sensing data											
001	Chubi	, ing the	10111010	sensing	Guutu								
CO3	Eval	uate the	accura	cv of ir	nage cla	ssificatio	on						
000				• • • • • •									
CO4	Appl	Apply advanced processing methods to map geographical features											
		v advar	iced pro	DCESSIN	<sup>7</sup> metho	ds to mar	o geograpi	hical features					
	i ppi	y advar	nced pro	ocessing	g metho	ds to map	o geograpl	hical features					
Mannin		-				-	0 0 1		vram Si	pecific			
<b>Mapping</b> <b>Outcom</b>	g of Co	-				-	0 0 1	hical features (POs) & Prog	gram Sj	pecific			
•• •	g of Co	-				-	0 0 1		gram Sj PSO3	pecific PSO4			
Outcom	g of Co	ourse O	utcome	es (COs	s) to Pro	ogram O	utcomes (	(POs) & Prog					
Outcome COs	g of Co es: PO1	PO2	utcome PO3	es (COs PO4	s) to Pro PO5	ogram O	utcomes (	(POs) & Prog PSO2	PSO3	PSO4			
Outcom COs CO1	g of Co es: PO1 3	PO2	utcome PO3	es (COs PO4	3) to Pro PO5	ogram O PO6 -	utcomes ( PSO1 -	(POs) & Prog PSO2 -	PSO3	PSO4 2			
Outcom COs CO1 CO2	g of Co es: PO1 3 3	PO2 1 1	PO3 -	es (COs PO4 - -	<ul> <li>s) to Pro</li> <li>PO5</li> <li>1</li> <li>1</li> </ul>	pgram O PO6 - -	utcomes ( PSO1 - -	(POs) & Prog PSO2 - -	PSO3	<b>PSO4</b> 2 2 2			
COs CO1 CO2 CO3	g of Co es: PO1 3 3 3	PO2 1 1	PO3 - -	es (COs PO4 - -	<ul> <li>s) to Pro</li> <li>PO5</li> <li>1</li> <li>1</li> <li>1</li> </ul>	pgram O PO6 - - -	utcomes ( PSO1 - - -	(POs) & Prog PSO2	PSO3	PSO4           2           2           2           2           2           2			
Outcom COs CO1 CO2 CO3 CO4	g of Co es: PO1 3 3 1 1.75	PO2 1 1 1	PO3 - - 1	es (COs PO4 - - - -	s) to Pro PO5 1 1 1 -	pgram O       PO6       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -	utcomes ( PSO1 - - - -	(POs) & Prog PSO2	PSO3	PSO4 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2			
Outcom COs CO1 CO2 CO3 CO4 Average	g of Co es: PO1 3 3 1 1.75	PO2 1 1 1 1 1 t:	PO3 - - 1	es (COs PO4 - - - -	<ul> <li>a) to Pro</li> <li>PO5</li> <li>1</li> <li>1</li> <li>1</li> <li>-</li> <li>0.75</li> </ul>	ogram O         PO6         -         -         -         -         0.75	utcomes ( PSO1 - - - -	(POs) & Prog PSO2	PSO3	PSO4 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2			
Outcom COs CO1 CO2 CO3 CO4 Average Course	g of Co es: PO1 3 3 3 1 1.75 Conten	PO2 1 1 1 1 1 t:	utcome PO3 - - 1 0.25	es (COs PO4 - - - -	<ul> <li>a) to Pro</li> <li>PO5</li> <li>1</li> <li>1</li> <li>1</li> <li>-</li> <li>0.75</li> </ul>	pgram O PO6 0.75	utcomes ( PSO1	(POs) & Prog PSO2	PSO3	PSO4 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2			





Unit	Content	Competency							
1	Explain Data Products and Their Characteristics C2 (Understand)								
	Digital image formation, digital image display mechanism, image histograms and								
	look up table data. C1 (Remember)								
	Pre-processing – Atmospheric, Radiometric,	Pre-processing – Atmospheric, Radiometric,							
	Implement Geometric Corrections - Basic Principles of Visual Interpr	retation,							
	Ground Truth, Ortho rectification, Applications. C2 (Understand)								
2	Explain Linear and non-linear Contrast enhancement techniques, den	sity slicing,							
	pseudo colour images, spatial enhancement techniques (convolution f	filtering). C2							
	(Understand)								
	Describe spectral enhancement techniques.C2 (Understand)								
	Implement Image algebra, PCA, data fusion techniques. C6 (Create)								
	Explain Segmentation - Methods, MDL, Watershed, Mean-shift, Edge detection. C2								
	(Understand)								
	Explain Spectral indices - Vegetation indices, water related indices, indices related								
	to cloud properties. C2 (Understand)								
	Describe Google Earth Engine platform for satellite data processing. C2								
	(Understand)								
3	Explain Supervised Classification.C2 (Understand)								
	Training set - Statistical computation, understanding feature space &	scatter plots,							
	signature purity & separability.C2 (Understand)								
	Signature Baye's decision rule. C2 (Understand)								
	Implement Parallelepiped algorithm, maximum like-hood method, unsupervised an								
	hybrid classification techniques, classification analysis. C6 (Create)								
	Describe confusion matrix, error analysis & kappa coefficient. C2 (Understand)								
	Analysis of Multi-Temporal series and change detection. C2 (Understand)								
4	Explain Object based Fuzzy, ANN and SVM classification technique	s. C2							
	(Understand)								
	Implement sub-pixel mixture analysis. C6 (Create)								
	Define Object Oriented Image Classification. C1 (Remember)								



ct Hours
-

### **Assessment Methods:**

Formative	Summative
Multiple Choice Questions (MCQ)	Mid Semester Examination 1
Quiz	Mid Semester Examination 2
Seminars	University Examination
Problem Based Learning (PBL)	Short Answer Questions (SAQ)
Journal Club	Long Answer Question (LAQ)

Nature of Assessment	CO1	CO2	CO3	CO4
Quiz	✓	✓	✓	✓
Assignment / Presentation	✓	✓	✓	✓
Unit test	✓	✓	<ul> <li>✓</li> </ul>	✓
Mid Semester Examination 1	✓	✓	<ul> <li>✓</li> </ul>	✓
Mid Semester Examination 2	✓	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>
University Examination	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓



Feedback Proc	ess 2. Student's Feedback							
References:	TEXTBOOKS:							
	1. Digital Image Processing, John R J, Introductory Prentice Hall,New Jersey,2016.							
	2. Remote Sensing Imagery, Florence Tupin, Jordi Inglada and Jean-							
	Marie Nicolas, ISTE and Wiley, 2014.							
	3. Remote Sensing and Digital Image Processing, Jarocińska, Anna,							
	vander Meer, Freek D., Springer, 2016							
	<b>REFERENCE BOOKS:</b>							
	1. An Introduction to Support Vector Machines, Nello Cristiani and							
	John Shawe Taylor., Cambridge University Press, 2013							
	2. Remote Sensing and Image Interpretation, Lilles and, T.M., Kiefer,							
	R.W. and Chapman, J.W., Fifth Edition, John Wiley &Sons,2007.							
	3. Digital Image Processing, Gonzalez, Rafael C. and Richard E.							
	Woods, Third Edition, Pearson Education, London.							



				Facu	lty of Eng	gineering	& Tech	nology				
Name of t	he Dep	artmen	t			Civil Engineering						
Name of t	he Prog	gram				Master of Technology in Civil Engineering (Remote						
						Sensing and GIS)						
Course Co					1316024	2						
Course Title						Advance	ed GIS					
Academic Year Semester Number of Credits						Ι						
						II						
						1						
Course Pr	rerequi	site				NIL						
Course Synopsis						-	pping, a	applicatio	on of inte	e, project e rnet service		
Course O	utcome	s:										
At the end	of the o	course, s	student	s will	be able to:	:						
CO1	Cond	uct adva	anced s	patial	analyses u	using GIS	tools					
CO2	Study	GIS da	ata with	com	plex geosp	atial mode	els.					
CO3	Solve	the geo	ospatial	error	using GIS	tools.						
CO4	Deve	lop mod	lels in (	GIS us	sing Open	source and Web GIS.						
Mapping COs	of Cou	rse Out	comes PO	(COs		am Outco PO5	omes (P	Os)& Pr PSO1	ogram Sp PSO2	ecific Outc PSO3	omes: PSO4	
	1	2	3	4								
CO1	2	-	1	0		3	-	-	-	3	2	
CO2	2	1	1	1		3	-	-	-	3	2	
CO3	2	1	1	1		3	_	-	_	3	2	
CO4	2	1	1	1		3	-	-	-	3	2	
Average	2	0.75	1	0.75	5	3	-	-	-	3.0	2.0	
Course Co	ontent:	1	<u> </u>	1	1		<u> </u>	<u> </u>	<u> </u>	1		
		s/Week	、 、		T (Hours		-	Hours/V		Total Ho		



1	1 0 0			1
Unit	Content & Com	petencies		
1	GIS database ( Understand), Det propagation in G of GIS application Analyze). Choose changes due to Problem identific Project manager	(C2, Understand), D fine Handling error in IS (C3, Apply). Exami ons and users (C4, Ar sing and implementa GIS (C4, Analyze). I eation (C2, Understand	(C2, Understand), Explain bescribe the data qualit GIS (C1, Remember), Dene Human and Organization halyze), Justifying the investion of GIS (C4, Analy Discuss GIS project design), designing a data model er), Identify Implementation (C6, Create).	y parameters (C2, emonstrate the Error onal issues: The issue estment in GIS (C4, yze), Organizational on and management: (C6, Create), Define
2	(C2, Understand Demonstrate the Describe the Issu computer method (C1, Remember), Services (C2, Un	l), Discuss Client se Application of inter- ties in GIS and trends ( for handling spatial d Discuss Web Mappir	work (C1, Remember), D erver computing concept rnet services to GIS sof (C2, Understand): Discuss ata (C2, Understand), Defing (C2, Understand), Desc te the Application of Inte ware (C4, Analyze).	(C2, Understand), tware (C3, Apply). the Development of ine Web Page Basics ribe Geospatial Web
3	Demonstrate Dig Vector overlay an Viewshed analys	ital Terrain Modeling nalysis (C4, Analyze),	and other raster analysis ( Define TIN (C1, Rememb n (C3, Apply). Demons	ber). Demonstrate the
4	impedance (C2, Demonstrate the	Understand), Explain Network applications examine closest facility	(C2, Understand), Discu Overpass and underpas (C3, Apply): Examine S y allocation (C4, Analyze	s (C2, Understand). hortest path analysis

Learning Strategies	Contact Hours
Lecture	32
Practical	
Seminar/Journal Club	2
Small group discussion (SGD)	2
Self-directed learning (SDL) / Tutorial	1
Problem Based Learning (PBL)	2



Case/Project Based Learning (CBL)	2
Revision	4
Others If any:	
Total Number of Contact Hours	45

Formative	Summative
Multiple Choice Questions (MCQ)	Mid Semester Examination 1
Quiz	Mid Semester Examination 2
Seminars	University Examination
Problem Based Learning (PBL)	Short Answer Questions (SAQ)
Journal Club	Long Answer Question (LAQ)

Nature of Assessment	CO1	CO2	CO3	CO4
Quiz	✓	✓	<ul> <li>✓</li> </ul>	✓
Assignment / Presentation	✓	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>
Unit test	✓	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>
Mid Semester Examination 1	✓	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>
Mid Semester Examination 2	✓	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>
University Examination	✓	✓	✓	✓

Feedback Process		1. Student's Feedback				
		2. Course Exit Survey				
Students Feedback	is taken through various s	steps				
1. Regular feed	edback through the Mentor Mentee system.					
2. Feedback be	between the semester through Google forms.					
3. Course Exit	rse Exit Survey will be taken at the end of the semester.					
References:						
	1. Principles of GIS: P.A. Burrough and Rachel A.M. McDonnel,					
Oxford.						
	2. Concepts and Techn Prentice Hall.	niques of GIS by C.P. Lo and A.K.W. Yeung,				



3.	An Introduction to GIS by Heywood, Cornelius and Carver,						
	Pearson Education						
4.	Pinde Fu and Jiulin Sun, Web GIS: "Principles and						
	Applications", ISBN:9781589482456,ESRI, 2010.						



	Faculty of Engineering & Technology											
Name of the Department						Civil E	Civil Engineering					
Name of the Program						Master	Master of Technology in Civil Engineering (Remote					
							g and GIS)					
Course Code							13160243					
Course Title						GPS &	Surveyin	g				
Academic Year						1	1					
Semester												
Number o	of Cred	its				3	3					
Course Pr	rerequi	site				Survey	ing, Remot	te Sensing				
Course Sy	nopsis							e students witting GPS &			mportance of of GPS.	
Course O	utcome	es:						<u> </u>				
At the end	At the end of the course, students will be able to:											
CO1	Students will learn how to take observation and collect data from GPS.											
CO2	Stude	ents wil	ll be able	e to uno	derstand	the applic	ation of GI	PS				
CO3	Stud	lents wi	ill be abl	e to un	derstan	d different	types of Gl	PS and its te	chnica	al descri	iption.	
CO4	Unde	erstand	the conc	ept of	MS Acc	cess.	<u>s.</u>					
Mapping	of Cou	rse Ou	tcomes	(COs)	to Prog	gram Outco	omes (POs	s) & Progra	m Spe	ecific O	utcomes:	
COs	PO	PO	PO	PO	PO	РО	PSO1	PSO2	PS	503	PSO4	
	1	2	3	4	5	6						
CO1	2	1	1	0	3	-	-	2		3	1	
CO2	2	1	1	1	3	-	-	2		3	1	
CO3	2	1	1	1	3	-	-	2		3	1	
CO4	2	1	1	1	3	-	-	2		3	1	
Average	2	1	1	0.75	3	-	2 3 1					
			· · ·									
Course Co	ontent:											
L	(Hour	s/Week	<b>x</b> )	1	T (Hou	rs/Week)	P (I	Hours/Week	<b>x</b> )	Total	Hour/Week	
	0	)				0		4			4	



	Content & Competencies						
Unit	Content						
1	Discuss Maps & their numbering (C2, Understand), Describe Ma	p projection and co-					
	ordinate system (C2, Understand), Define Geo referencing and da	ata (C1, Remember),					
	Define Basic concepts of GPS (C1, Remember): History and timeli	ne, overview. pseudo					
	range and carrier phase measurements (C2, Understand); Describe	Signal structure (C2,					
	Understand); Explain GPS coordinate systems (C2, Understand): WGS-84, GPS time;						
	GPS Errors and biases; GPS orbital Geometry and Navigat	tional solution (C2,					
	Understand).						
2	Explain System Segmentation – Space segment (C2, Understan	d); Describe control					
	segment (C2, Understand), Discuss user segment (C2, Understand	nd)- Differentiate the					
	types of receivers (C4, Analyze); Discuss GPS satellite signal	s (C2, Understand),					
	Define GPS data, position and time from GPS (C1, Remember),	Explain code phase					
	tracking, pseudo range navigation, receiver position, time and velocity, carrier phase						
	tracking (C2, Understand), Demonstrate GPS positioning types - absolute positioning,						
	differential positioning (C3, Apply); Define Navigation signals -GPS frequencies (C1,						
	Remember); Calculating positions using C/A code using P(Y) of	Remember); Calculating positions using C/A code using P(Y) code, code phase v/s					
	carrier phase, augmented GPS, local augmentation (C6, Create); De	escribe Accuracy and					
	error sources - atmospheric effects, multipath effects, ephemer	is and clock errors;					
	selective availability, relativity, sagnac distortion (C2, Understand)						
3	Explain the factors that affect GPS (C2, Understand) - Discuss the	number of satellites,					
	multipath, ionosphere, troposphere, satellite geometry, satellite he	ealth, signal strength,					
	distance from the reference receiver, RF interference, loss of rad	lio transmission (C2,					
	Understand); Demonstrate other satellite based navigational s	ystems: GLONASS,					
	GALILEO (C3, Apply). Explain GPS interference and jamming - natural sources,						
	artificial sources (C2, Understand); Discuss the techniques to	artificial sources (C2, Understand); Discuss the techniques to improve accuracy -					
	augmentation, precise monitoring, GPS time and data, GPS modernization (C2,						
	Understand).						
4	Define Military – airborne, marine and land based navigation (	C1, Remember), and					
	Discuss civilian – surveying and mapping (C2, Understand), Exp	lain control surveys,					



cadastral surveying (C2, Understand), navigation, RS, GIS and Photogrammetry (C4, Analyze), geodesy, location, navigation, tracking, mapping and timing, Engineering and Monitoring (C4, Analyze); Special applications of GPS, etc. (C3, Apply).

# **Teaching Learning Strategies and Contact Hours**

Learning Strategies	Contact Hours
Lecture	32
Practical	
Seminar/Journal Club	2
Small group discussion (SGD)	2
Self-directed learning (SDL) / Tutorial	1
Problem Based Learning (PBL)	2
Case/Project Based Learning (CBL)	2
Revision	4
Others If any:	
Total Number of Contact Hours	45

# **Assessment Methods:**

Formative	Summative
Multiple Choice Questions (MCQ)	Mid Semester Examination 1
Quiz	Mid Semester Examination 2
Seminars	University Examination
Problem Based Learning (PBL)	Short Answer Questions (SAQ)
Journal Club	Long Answer Question (LAQ)

Nature of Assessment	CO1	CO2	CO3	CO4
Quiz	✓	√	✓	✓



Assignment / Presentation	✓	✓	✓	✓	
Unit test	✓	✓	✓	✓	
Mid Semester Examination 1	✓	✓	✓	✓	
Mid Semester Examination 2	✓	✓	✓	✓	
University Examination	✓	✓	✓	•	

Feedback Process	1.	1. Student's Feedback				
	2. Course Exit Survey					
<b>References:</b>	1 Understanding GPS: I	Principles and Applications Elliott Kaplan,				
	Christopher Hearty					
	2. Introduction to GPS:	The Global Positioning System Ahmed El-				
	Rabbany					



Faculty of Engineering & Technology					
Name of the Department	Civil Engineering				
Name of the Program	Master of Technology in Civil Engineering (Remote				
	Sensing and GIS)				
Course Code	13160244				
Course Title	Advanced GIS Lab				
Academic Year	Ι				
Semester	II				
Number of Credits	2				
Course Prerequisite	NIL				
Course Synopsis	To design electrical systems. To analyze a given				
	network by applying various network theorems. To				
	know the response of electrical circuits for different				
	excitations. To study various electrical measuring				
	instruments and transducers. To summarize the				
	performance characteristics of electrical machines				

# **Course Outcomes:**

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

CO1	Understand the basic concepts and terminology of electrical quantities
CO2	Analyze the DC circuit using various network theorems
CO3	Understand the response of different types of electrical circuits to different excitations
CO4	Understand the measurement, calculation and relation between the basic electrical parameter.

# Mapping of Course Outcomes (COs) to Program Outcomes (POs) & Program Specific Outcomes:

COs	PO	PO	PO	PO	PO	PO	PSO1	PSO2	PSO3	PSO4
	1	2	3	4	5	6				
CO1	2	-	1	-	3	-	-	2	3	1
CO2	2	1	1	1	3	-	-	2	3	1
CO3	2	1	1	1	3	-	-	2	3	1
CO4	2	1	1	1	3	-	-	2	3	1
Average	2	1	1	1	3	-	-	2	3	1



L (1	Hours/Week)	T (Hours/Week)	P (Hours/Week)	Total Hour/Week					
	0	0	4	4					
		Content & Compe	tencies						
Unit	Title								
1	Familiarization	of electrical Elements, so	ources, measuring device	s and transducers					
	related to electr	ical circuits. C1 (Remem	per)						
2	Verification of	KVL and KCL. C6 (Crea	te)						
3	Verification of	Thevenin's and Norton's	theorems. C6 (Create)						
4	Verification of	superposition theorem. C	б (Create)						
5	Verification of	maximum power transfer	theorem. C6 (Create)						
6	Calculations an	d Verification of Impedar	nce and Current of RL, R	C and RLC series					
	circuits. C6 (Cr	eate)							
7	Verification of	relation between phase ar	d line quantities in a 3-p	hase balanced star and					
	delta connected	delta connected systems. C6 (Create)							
8	Measurement o	f Active and Reactive Por	wer in a balanced Three-	phase circuit. C6					
	(Create)								
9	Torque-Speed C	Characteristics of a Separa	ately/Self Excited DC Sh	unt/Compound					
	Motor. C1 (Ren	nember)							
10	Load test on sin	gle phase transformer. C	1 (Remember)						
11	Demonstration	of measurement of electri	cal quantities in DC and	AC systems. C6					
	(Create)								

Teaching - Learning Strategies	Contact Hours
Lecture	
Practical	30
Seminar/Journal Club	
Small group discussion (SGD)	20
Self-directed learning (SDL) / Tutorial	



Problem Based Learning (PBL)	10
Case/Project Based Learning (CBL)	
Revision	
Others If any:	
Total Number of Contact Hours	60

Formative	Summative
Multiple Choice Questions (MCQ)	Mid Semester Examination 1,2, End term
Viva-voce	
Objective Structured Practical Examination (OSPE)	University Examination
Quiz	Multiple Choice Questions (MCQ)
Seminars	Multiple Choice Questions (MCQ)
Problem-Based Learning (PBL)	Short Answer Questions (SAQ)
Journal Club	Long Answer Question (LAQ)
	Practical Examination & Viva-voce
	Objective Structured Practical Examination
	(OSPE)

Nature of Assessment				CO2	CO3	CO4			
VIVA				~	✓	✓			
Practical Log Book/ Record Book				✓	✓	✓			
University Examination				✓	✓	✓			
Feedback Process1. Student's Fe				's Feedback					
	2. Course Exit Su	urvey							
<b>References:</b> Spatial Analysis Methods and Practice:			escribe –	Explore	– Expla	in			
through GIS, Cambridge University Pre			(11 June	2020).					



		I	acul	ty of En	gineer	ring & [	Fechnol	logy		
Name of the l	Depart	ment		Civil	Engin	neering				
Name of the	Progra	m		Mast	Master of Technology in Civil Engineering (Remote					
	_			Sensi	ing an	d GIS)	Structu	ral Eng	gineering	_
<b>Course Code</b>										
Course Title Sa					lite In	age Pro	ocessing	g Lab		
Academic Ye	Ι									
Semester				II						
Number of Credits 1										
<b>Course Prere</b>	quisite	<u>)</u>		Imag	e proc	cessing 1	lab			
Course Syno	psis			This	course	mainly	deals w	vith dat	a products	s, digital image
										segmentation,
						fication		-	<u> </u>	-
<b>Course Outco</b>	omes:						-1			
At the end of		rse stud	lents	will be a	ble to:					
CO1				nsing dat			processi	ng tech	niques.	
CO2				note sens			L	0	1	
CO3		2		acy of im	<u> </u>		ion			
CO4								raphica	l features	
Mapping of (										m Specific
Outcomes:		0			8-		••••	(100)		
COs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	-	-	3	3	3	3	3	3	3	3
CO2	-	-	3	3	3	3	3	3	1	3
CO3	-	-	3	3	3	3	3	3	3	2
CO4	-	-	3	3	3	3	3	3	3	2
Average	-	-	3	3	3	3	3	3	2.5	2.5
							•			
<b>Course Con</b>	itent:									
L (Hor	urs/Wee	k)		T (Hou	rs/Wee	k) ]	P (Hours/Week)		Total	Hour/Week
	0	,			0		2			2
Experiment	No.					0	Content			
1.		Image	Dist	play & C	lolor T			wledge	)	
2.										nagery (C1,
		Know			U		•			
3.		Polyn	omia	l Rectifie	cation	(C4, Ar	alysis)			
4.		-		Imagery						
5.				n: multi-			ning (C4	, Analy	sis)	
6.				ion of im						
7.									ent (C2, U	Understand)



Teaching - Learning Strategies	Contact Hours	
Lecture		
Practical	13	
Seminar/Journal Club		
Small group discussion (SGD)	04	
Self-directed learning (SDL) / Tutorial		
Problem Based Learning (PBL)	13	
Case/Project Based Learning (CBL)		
Revision		
Others If any:		
Total Number of Contact Hours	30	

Formative	Summative
Multiple Choice Questions (MCQ)	Mid Semester Examination 1
Viva-voce	Mid Semester Examination 2
Objective Structured Practical Examination	University Examination
Quiz	Dissertation
Seminars	Multiple Choice Questions (MCQ)
Problem Based Learning (PBL)	Short Answer Questions (SAQ)
Journal Club	Long Answer Question (LAQ)
	Practical Examination & Viva-voce
	Objective Structured Practical Examination

Nature of Assessment	CO1	CO2	CO3	
Quiz				
VIVA	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	
Assignment / Presentation				
Unit test				
Practical Log Book/ Record Book	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	
Mid Semester Examination 1				
Mid Semester Examination 2				
University Examination (External	✓	<ul> <li>✓</li> </ul>	✓	
Practical)				
	1		- <b>I</b>	I.
Feedback Process	3. Stu	ident's Fe	edback	
Students Feedback is taken through var	ious steps			



- 3. Regular feedback through Mentor Mentee system
- **4.** Feedback between the semester through google forms



# **SEMESTER - III**

Course Code	Course Title				
13160367	Dissertation Phase-I				
Transportation Engi	Transportation Engineering (Choose these subjects for specialization)				
13160357	7 Intelligent Transportation Systems				
<b>Program Elective-I Po</b>	ol (Choose One from the pool)				
13160355	Construction Project Management & BOT				
13160368	Traffic Management and Road Safety				
13160359	Highway Construction Practices				
Program Elective-II Po	bol (Choose One from the pool)				
13160369	Pavement evaluation, Rehabilitation & Maintenance				
13160363	Environment Impact Assessment				
13160365	Bridge Engineering				
	ng (Choose these subjects for specialization)				
13160305	Theory & Design of Plate and Shell				
	ol (Choose One from the pool)				
13160325	Pre-Fabricated Structures				
13160327	Design of Industrial Structures				
13160329Maintenance & Rehabilitation of Structures					
Program Elective-II P	ool (Choose One from the pool)				
13160331	Design of Bridges				
13160333	Composite Structures				
13160335	Design of Tall Buildings				
Remote Sensing and	GIS (Choose these subjects for specialization)				
13160370	Digital Image Processing				
Program Elective-I Po	ol (Choose One from the pool)				
13160371	Web and Mobile GIS				
13160372	Argo Remote Sensing				
13160373	Remote Sensing Geology				
0	pol (Choose One from the pool)				
13160374	Global Navigation Satellite System				
13160375	Advanced Surveying and Cartography				
13160376	Pattern Recognition and Machine Learning				



			Facul	ty of E	ngine	ering	& Tech	nology			
Name of the	me of the Department				Civil Engineering						
	f the Program				Master of Technology in Civil Engineering (Structural						
					Engineering)						
Course Code	e			1316							
<b>Course Title</b>	ļ			Disse	ertatio	n Pha	se-I				
Academic Y	ear			II	II						
Semester				III							
Number of (	Credits			6	6						
<b>Course Prer</b>	equisit	e		Rese	arch m	ethod	ology				
Course Sync	opsis									research problem	
Course O4				and v	vill coi	inplete	the lite	rature re	view for	I nesis.	
Course Oute At the end of		una at-	donta		abla t	<b>.</b> .					
CO1							rouiou	ing avail	abla lita	roturo	
CO2			opriat	e techn	iques	to ana	lyze con	nplex pro	oblems r	elated to civil	
	0	eering									
CO3		tigate a		-							
Mapping of Outcomes:	Course	e Outco	omes (	COs) t	o Prog	gram	Outcom	nes (POs	) & Prog	gram Specific	
COs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	
CO1	3	3	3	3	3	3	3	3	3	3	
CO2	3	3	3	3	3	3	3	3	3	3	
CO3	3	3	3	3	3	3	3	3	3	3	
Average	3	3	3	3	3	3	3	3	3	3	
	•								-		
Course Co	ntent	:									
L (Hours/Week)			T (Hours/Week)			P (Hours/Week)			Total Hour/Week		
0			0 12 12					12			
Experimen	t No.						Conte	-			
1			•	+				-		uitable solution	
				-				4, Analyz	ze), Inve	stigate and	
	develop the solution (C6, Create)										

Teaching - Learning Strategies	Contact Hours
Lecture	
Practical	
Seminar/Journal Club	
Small group discussion (SGD)	
Self-directed learning (SDL) / Tutorial	
Problem Based Learning (PBL)	90



Case/Project Based Learning (CBL)	90
Revision	
Others If any:	
Total Number of Contact Hours	180

Formative	Summative
Multiple Choice Questions (MCQ)	Mid Semester Examination 1
Viva-voce	Mid Semester Examination 2
Objective Structured Practical Examination	University Examination
Quiz	Dissertation
Seminars	Multiple Choice Questions (MCQ)
Problem Based Learning (PBL)	Short Answer Questions (SAQ)
Journal Club	Long Answer Question (LAQ)
	Practical Examination & Viva-voce
	Objective Structured Practical Examination

# Mapping of Assessment with COs

Nature of Assessment	C01	CO2	CO3	
Quiz				
VIVA	✓	✓	<ul> <li>✓</li> </ul>	
Assignment / Presentation	✓	✓	<ul> <li>✓</li> </ul>	
Unit test				
Practical Log Book/ Record Book	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	
Demonstration	✓	✓	<ul> <li>✓</li> </ul>	
Mid Semester Examination 1				
Mid Semester Examination 2				
University Examination (External	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	
Practical)				
Foodbook Drooog	1 54	idant'a Fa	adhaalt	
Feedback Process		ident's Fe	edback	
Students Feedback is taken through vari 1. Regular feedback through Mento	-	stem		
2. Feedback between the semester			1	

2. Feedback between the semester through Google forms



# Master of Technology in Civil Engineering (Transportation Engineering) 3<sup>rd</sup> Semester



			Fac	ulty of 1	Enginee	ering &	Technolog	у				
Name of the	ne Dep	artmen	nt	Civ	il Engin	eering						
Name of the	he Prog	gram		Ma	ster of T	Technolo	ogy in Civil	Engine	ering (Transpo	ortation		
		-		Eng	Engineering)							
Course Co	ode			131	13160357							
Course Ti	tle			Int	Intelligent Transportation Systems							
Academic	Year			II								
Semester				III								
Number o	f Credi	its		4	4							
Course Pr	erequi	site		Hig	hway E	ngineer	ing					
Course Sy	nopsis			Intr	oduction	to ITS	and overview	v, Its ap	plications and 1	Highway		
-									stem, Interacti			
				reco	ognition a	and its a	pplications, I	TS com	ponents and star	ndards		
Course Ou												
At the end												
CO1		2					ces and their	1				
CO2		1				0,	solve real-li		1			
CO3		timate vices.	traffic	conges	tion by	the a	equisition of	of big	data using a	dvanced		
CO4	De	esign an	d impl	ement s	uitable I	TS and	services for	· effectiv	ve transportati	on.		
CO5	Se	lect sui	table st	andards	for effe	ective in	nplementation	on of IT	<u>'S</u>			
005	50						ip to moneau	JII OI II	2			
							-		rogram Spec	ific		
	of Cou						-			ific		
Mapping	of Cou						-			ific		
Mapping	of Cou						-		rogram Spec	ific PSO4		
Mapping Outcomes	of Cou :	rse Out	tcomes	(COs)	to Prog	ram Ou	itcomes (PO	Ds) & P	rogram Spec			
Mapping o Outcomes COs	of Cou : PO1	rse Out	PO3	(COs)	to Prog	ram Ou PO6	PSO1	Ds) & P PSO	2 PSO3	PSO4		
Mapping o Outcomes COs CO1	PO1	PO2	PO3	(COs) 1 PO4 2	PO5	ram Ou PO6	PSO1	Ds) & P PSO 2	Program Spec 2 PSO3 3	PSO4 3		
Mapping o Outcomes COs CO1 CO2	PO1 2 3	PO2 2 3	PO3 2 2	(COs) 1 PO4 2 2	PO5	ram Ou PO6 1 1	PSO1	Pso         Pso           2         2           2         2	Program Spec 2 PSO3 3 3 3	PSO4 3 3		
Mapping o Outcomes COs CO1 CO2 CO3	PO1 2 3 3 3 3 3	PO2 2 3 3	PO3 2 2 2 2	(COs) 1 PO4 2 2 2	PO5 2 1 1	ram Ou PO6 1 1 2	PSO1 2 2 2 2	PSO           2           2           2           2           2	Program Spec	PSO4 3 3 3		
Mapping o Outcomes COs CO1 CO2 CO3 CO4	PO1 2 3 3 3	PO2 2 3 3 2	PO3 2 2 2 2 2 2 2	(COs) 1 PO4 2 2 2 2 2	PO5 2 1 2 2 2 2 2 1 2 2 2 2 2 2 2 2 2 2 2	ram Ou PO6 1 1 2 1	PSO1 2 2 2 2 2 2	PSO           2           2           2           2           2           2           2           2           2           2           2	Program Spec           2         PSO3           3         3           3         3           3         3           3         3	PSO4 3 3 3 3 3		
Mapping o Outcomes COs CO1 CO2 CO3 CO4 CO5	PO1 2 3 3 3 3 3	PO2 2 3 3 2 2	PO3 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	(COs) 1 PO4 2 2 2 2 2 2 2	PO5 2 1 1 2 1 1 2 1	ram Ou PO6 1 1 2 1 1 1	PSO1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	PSO       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2	Program Spec           2         PSO3           3         3           3         3           3         3           3         3           3         3	PSO4 3 3 3 3 3 3 3		
Mapping o Outcomes COs CO1 CO2 CO3 CO4 CO5	PO1 2 3 3 3 2.8	PO2 2 3 3 2 2 2.4	PO3 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	(COs) 1 PO4 2 2 2 2 2 2 2	PO5 2 1 1 2 1 1 2 1	ram Ou PO6 1 1 2 1 1 1	PSO1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	PSO       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2	Program Spec           2         PSO3           3         3           3         3           3         3           3         3           3         3	PSO4 3 3 3 3 3 3 3		
Mapping o Outcomes COs CO1 CO2 CO3 CO4 CO5 Average Course (	PO1 2 3 3 3 2.8 Conter	PO2 2 3 3 2 2 2.4 nt:	PO3 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	(COs) 1 PO4 2 2 2 2 2 2 2 2	PO5 2 1 1 2 1 1 1 4	ram Ou PO6 1 1 2 1 1 1.2	PSO1         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2	PSO       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2	Program Spec           2         PSO3           3         3           3         3           3         3           3         3           3         3	PSO4 3 3 3 3 3 3 3 3 3		
Mapping o Outcomes COs CO1 CO2 CO3 CO4 CO5 Average Course (	PO1 2 3 3 3 2.8	PO2 2 3 3 2 2 2.4 nt:	PO3 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	(COs) 1 PO4 2 2 2 2 2 2 2 2	PO5 2 1 1 2 1 1 2 1	ram Ou PO6 1 1 2 1 1 1.2	PSO1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	PSO       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2	Program Spec         2       PSO3         3       3         3       3         3       3         3       3         3       3         3       3	PSO4 3 3 3 3 3 3 3 3 3		
Mapping o Outcomes COs CO1 CO2 CO3 CO4 CO5 Average Course (	PO1 2 3 3 3 3 2.8 Contei Hours/V 3	PO2 2 3 3 2 2 2.4 nt:	PO3 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	(COs) 1 PO4 2 2 2 2 2 2 2 2	PO5           2           1           2           1           1           2           1           1           1.4	ram Ou PO6 1 1 2 1 1 1 1.2 ek)	PSO1 2 2 2 2 2 2 2 P (Hours/V	PSO       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2	Program Spec PSO3 PSO3 PSO3 PSO3 PSO3 PSO3 PSO3 PSO3	PSO4 3 3 3 3 3 3 3 3 3		
Mapping o Outcomes COs CO1 CO2 CO3 CO4 CO5 Average Course ( L (	PO1 PO1 2 3 3 2.8 Conter Hours/V 3 it	rse Out PO2 2 3 3 2 2 2.4 nt: Week)	PO3 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	(COs) 1 PO4 2 2 2 2 2 2 2 2 7 (H	to Progr PO5 2 1 1 2 1 1 1.4 (ours/We 1	ram Ou PO6 1 1 2 1 1 1 1.2 ek)	PSO1 PSO1 2 2 2 2 2 2 2 P (Hours/V 0 Content	PSO       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2	Program Spec PSO3 PSO3 PSO3 PSO3 PSO3 PSO3 PSO3 PSO3	PSO4 3 3 3 3 3 3 3 /Week		
Mapping o Outcomes COs CO1 CO2 CO3 CO4 CO5 Average Course ( L (	PO1 PO1 2 3 3 2.8 Conter Hours/V 3 it	rse Out PO2 2 3 3 2 2 2 2.4 nt: Week) Ov	PO3 2 2 2 2 2 2 2 2 verview	(COs) 1 PO4 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	PO5           2           1           2           1           1           2           1           1.4           fours/Wet           1           istory of	ram Ou PO6 1 1 2 1 1 1.2 ek) f ITS (	PSO1 PSO1 2 2 2 2 2 2 2 2 2 P (Hours/V 0 Content C1, Remen	PSO         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         ber), I'	Program Spec PSO3 PSO3 PSO3 PSO3 PSO3 PSO3 PSO3 PSO3	PSO4 3 3 3 3 3 3 /Week ons (C3,		
Mapping o Outcomes COs CO1 CO2 CO3 CO4 CO5 Average Course ( L (	PO1 PO1 2 3 3 2.8 Conter Hours/V 3 it	rse Out PO2 2 3 3 2 2 2 2.4 nt: Week) Ov Ap	PO3 2 2 2 2 2 2 2 2 verview	(COs) 1 PO4 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	PO5           2           1           2           1           1           2           1           1.4           fours/Wet           1           istory of	ram Ou PO6 1 1 2 1 1 1.2 ek) f ITS (	PSO1 PSO1 2 2 2 2 2 2 2 2 2 P (Hours/V 0 Content C1, Remen	PSO         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         ber), I'	Program Spec       2     PSO3       3     3       3     3       3     3       3     3       3     3       4     TS Application	PSO4 3 3 3 3 3 3 /Week ons (C3,		
Mapping o Outcomes COs CO1 CO2 CO3 CO4 CO5 Average Course ( L (	PO1 2 3 3 2.8 Conter Hours/V 3 it	rse Out PO2 2 3 3 2 2 2.4 nt: Week) Ov Ap Ar	PO3 2 2 2 2 2 2 2 2 2 verview ply); F alyze)	(COs) 1 PO4 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	PO5 2 1 1 2 1 1 2 1 1 4 fours/We 1 story of TS Prog	ram Ou PO6 1 1 2 1 1 1.2 ek) f ITS ( grams, I	PSO1 2 2 2 2 2 2 2 2 P (Hours/V 0 Content C1, Remen mproving H	PSO PSO 2 2 2 2 2 2 2 2 2 2 2 2 2	Program Spec       2     PSO3       3     3       3     3       3     3       3     3       3     3       4     TS Application	PSO4 3 3 3 3 3 3 /Week ons (C3, TS (C4,		
Mapping o Outcomes COs CO1 CO2 CO3 CO4 CO5 Average Course ( L ( Un 1.	PO1 2 3 3 2.8 Conter Hours/V 3 it	rse Out PO2 2 3 3 2 2 2.4 2.4 1t: Week)	PO3 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	(COs) 1 PO4 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	PO5 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 5 Cours/We	PO6 1 1 1 2 1 1 1.2 ek) f ITS ( grams, I ation Sy Mana	PSO1 2 2 2 2 2 2 2 2 2 P (Hours/V 0 Content C1, Remen mproving H rstems A Cas gement C	PSO PSO 2 2 2 2 2 2 2 2 2 2 2 2 2	Program Spec         2       PSO3         3       3         3       3         3       3         3       3         3       3         7       TS Application         y Safety with I       1         y C2, Understation       1         y C3, Understation       1         y C3, Understation       1         y C4, Anally       1	PSO4 3 3 3 3 3 3 3 /Week ms (C3, TS (C4, md); VA yze);ITS		
Mapping o Outcomes COs CO1 CO2 CO3 CO4 CO5 Average Course ( L ( Un 1.	PO1 2 3 3 2.8 Conter Hours/V 3 it	rse Out PO2 2 3 3 2 2 2 2.4 nt: Veek) Ov Ar Ad DC Tei	PO3 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	(COs) 1 PO4 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	PO5 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 5 5 5 5	PO6 1 1 2 1 1 1 1.2 ek) f ITS ( grams, I ation Sy Mana nologies	PSO1 2 2 2 2 2 2 2 2 2 P (Hours/V 0 Content C1, Remen mproving H rstems A Cas gement C	PSO2222222222222ber), I'lighwayse StudyonceptVehicle	Program Spec         2       PSO3         3       3         3       3         3       3         3       3         3       3         3       3         7       Total Hour         4       4         TS Application       7         7 (C2, Understation       1	PSO4 3 3 3 3 3 3 3 /Week ms (C3, TS (C4, md); VA yze);ITS		



3.	Understand Interactive Voice Recognition (IVR) Technologies (C2,
	Understand); ITS Mobile Applications (C3, Apply)
4.	Understand analyze Economics of ITS Congestion and Pricing Revenue
	Generation Models (C2, Understand, C4, Analyze)

Teaching - Learning Strategies	Contact Hours
Lecture	35
Practical	
Seminar/Journal Club	
Small group discussion (SGD)	
Self-directed learning (SDL) / Tutorial	15
Problem Based Learning (PBL)	4
Case/Project Based Learning (CBL)	4
Revision	2
Others If any:	
Total Number of Contact Hours	60

### **Assessment Methods:**

Formative	Summative
Quiz	Mid Semester Examination 1
Seminars	Mid Semester Examination 2
Problem Based Learning (PBL)	University Examination
	Short Answer Questions (SAQ)
	Long Answer Question (LAQ)

Nature of Assessment	CO1	CO2	CO3	<b>CO4</b>	CO5	
Quiz	✓	✓	✓	<ul> <li>✓</li> </ul>	$\checkmark$	
VIVA						
Assignment / Presentation	✓	✓	✓	✓	$\checkmark$	
Unit test	✓	✓	✓	✓	$\checkmark$	
Practical Log Book/ Record Book						
Mid Semester Examination 1	✓	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	
Mid Semester Examination 2	✓	✓	✓	✓	$\checkmark$	
University Examination	✓	✓	✓	✓	$\checkmark$	
Feedback Process	1. Student's Feedback					
Students Feedback is taken through	various s	teps				
1. Regular feedback through M	entor Me	entee syst	em			
<b>2.</b> Feedback between the semes	ter throu	gh google	e forms			
References:						



Text Books
1. Rangawala, Building Construction (2010) ISBN No. 978-93-
80358-15-4, Charotar Publications Pvt. Ltd. 28th Edition
Referance books
1. P.C.Varghese, Engineering Materials, 1st edition, PHI
Learning.
2. S.K.Duggal, Building Materials, 3rd Edition, New Age
International Publishers.
3. Sushil Kumar, Building Construction, Standard Publishers
Distributors.
4. M.S.Shetty, Concrete Technology: Theory and Practice, S.
Chand Publishers.
5. A.R.Santhakumar, Concrete Technology, Oxford University
Press.



# Master of Technology in Civil Engineering (Transportation Engineering) **Departmental Electives**



			Fac	ulty of I	Engine	ering &	& Technolo	gy		
Name of th	ie Dep	artmen	t			ineering				
Name of th	ie Prog	gram		Ma	ster of	Techno	ology in Civ	il Engin	eering	
		-		(Tr	(Transportation Engineering)					
Course Co	de			131	13160355					
Course Tit	tle			Co	Construction Project Management & BOT					
Academic	Year			II						
Semester				III						
Number of	f Cred	its		3						
Course Pr	erequi	site		PE	RT and	I CPM				
Course Sy	nopsis			Un	derstan	ding th	he various	stages of	of project, Ec	conomic
				and	l finar	ncial a	analysis of	project	, Project se	election,
				Net	twork	schedu	ling, Use o	f Projec	t Planning So	oftware,
							ect operation		C	ŕ
Course Outcomes:				I	5	, - <u>J</u> -	1			
At the end			student	s will be	e able t	0:				
CO1							managemer	t for any	, infrastructur	e
001		oject		p 01 000						-
CO2 Overall development				ment of	studen	ts in ho	w to deal w	ith differ	rent – differer	nt
			-	in the p						
CO3	-	-		-	•	softwa	re in flow le	ss execu	tion of any	
		frastruc							•	
CO4	Ap	oply the	conce	pts of fa	ilure th	neories	for design of	of structu	ires	
Mapping of	of Cou	rse Out	comes	(COs)	to Pro	gram (	Dutcomes (1	<b>POs) &amp;</b> 2	Program Spe	cific
Outcomes	:									
		T								
COs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	2 PSO3	PSO4
CO1	3	2	3	3	2	1	2	2	3	3
CO2	2	3	2	3	2	1	2	2	3	3
CO3	2	3	2	3	2	1	2	2	3	3
CO4	2	3	3	3	2	1	2	2	3	3
Average	2.5	2.75	2.5	3	2	2	2	2	3	3
				•			•	•		
Course C	Conter	nt:								
-	Hours/V			T (H	ours/We	eek)	P (Hours/V	Week)	Total Hour	/Week
	3	, ,			0	,	0	,	3	
Un	it						Content			
1.		Un	derstan	d founda	ations c	of Project		ent (C1,R	temember), Un	derstand
									ion methodolo	
		-		-	Project	Proposa	al (C3, Appl	y), Projec	et Scope under	standing
~			1,Reme					D	) No41	
				na the B	ne Breakdown Structure (C1, Remember). Network					
		C ·	la a d1'						4, Analyze),	



	Program Evaluation & Review Technique (C5, Evaluate), Planning and Scheduling of Activity Networks (C2, Understand), Assumptions in PERT (C1, Remember)
3.	Modeling - Time-cost Trade-offs, Linear Programming and Network
	Flow Formulations (C6, Create), PERT/COST Accounting (C5,
	Evaluate)
4.	Scheduling with limited resources (C3, Apply), Resource Planning and
	Resource Allocation (C3, Apply), Project Schedule Compression (C2,
	Understand), Project Scheduling Software, Precedence Diagrams,
	Decision CPM, Generalized Activity Networks, GERT (C6, Create)

Teaching - Learning Strategies	Contact Hours	
Lecture	36	
Practical		
Seminar/Journal Club		
Small group discussion (SGD)		
Self-directed learning (SDL) / Tutorial		
Problem Based Learning (PBL)	4	
Case/Project Based Learning (CBL)	3	
Revision	2	
Others If any:		
Total Number of Contact Hours	45	

Formative	Summative
Quiz	Mid Semester Examination 1
Seminars	Mid Semester Examination 2
Problem Based Learning (PBL)	University Examination
	Short Answer Questions (SAQ)
	Long Answer Question (LAQ)



Nature of Assessn	nent	CO1	CO2	CO3	CO4
Quiz		✓	✓	<ul> <li>✓</li> </ul>	✓
VIVA					
Assignment / Prese	entation	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓
Unit test		✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓
Practical Log Book	k/ Record Book				
Mid Semester Exam	mination 1	✓	<ul> <li>✓</li> </ul>	✓	✓
Mid Semester Example	mination 2	✓	✓	<ul> <li>✓</li> </ul>	✓
University Examin	ation	✓	✓	✓	✓
Feedback Process		1. Stu	ident's Fe	edback	
Students Feedback	is taken through	various	steps		
	dback through M		-	tem	
2. Feedback b	etween the seme	ster throu	ugh googl	le forms	
<b>References:</b>					
	Text Books:				
	1. Projects: P	lanning,	Analysis	s, Select	ion, Implementation &
	Review, Pra	-	•		-
	2. Project Ma	inagemen	nt: A sys	tems app	proach to planning and
	controlling,	Harold	Kerzner,	CBS Pu	blisher, New Delhi, 2nd
	Ed., 2000.				
	<b>Reference Boo</b>				
			roject M	anageme	nt, 8th edition, Gower
	Publishing	Limited.			
	2. AMS	1.			projects
	http://www	.amsrealt	ime.com/	products	/project.htm



			Faci	ulty of F	Ingine	ering &	k Technolog	w			
Name of th	ne Den	artmen			-	ineering		5J			
Name of th			l C		<u> </u>			1 Engir	peering		
i vanie or th	10 1 108	51 ann			Master of Technology in Civil Engineering (Transportation Engineering)						
Course Co	do			,	13160368						
Course Co					Traffic Management and Road Safety						
Academic						lanage	inent and K	uau sa	lety		
	rear										
Semester		•4		3							
Number of				3							
Course Pro	-				1	6 .	D :	1 1 .	XX. 1	6.4	
Course Sy	nopsis				hway	safety,		behavi	, 0, ,		
Course Ou	400000	~		mar	nageme	nt syste	m, Crash stati	stics an	d road safety at	ldit	
				a	<b>h</b> 1 . 4	~ .					
At the end							1	<b>f</b> - (			
CO1								c safety	concepts, cov	ering the	
CO2		ige from					nd design managemen	t anot	ems, differen	t safety	
02									their effective	5	
		ash inves			11 15500	5 WILLI	ountermeasu	ites and	then encenve	ness, and	
CO3				ation and	d remed	liation					
CO4		<u> </u>					evaluating co	unter m	easures		
				*					Program Sp	ecific	
Outcomes:			comes	(COS)	10110	gram (	Jutcomes (1	<b>U</b> 3) <b>U</b>	r togram sp	unit	
Juicomes:											
		PO2	PO3	PO4	PO5	PO6	PSO1	PSO	2 PSO3	PSO4	
COs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO	2 PSO3	PSO4	
COs CO1	PO1 3	2	2	3	2	2	2	2	3	3	
COs	PO1 3 3			3 3	2 2						
COs CO1	PO1 3	2	2	3	2	2	2	2	3	3	
COs CO1 CO2	PO1 3 3	2 2	2 2	3 3	2 2	2 2	2 2 2	2 2	3 3	3 3	
COs CO1 CO2 CO3	PO1 3 3 3	2 2 2	2 2 2	3 3 3	2 2 2 2	2 2 2 2	2 2 2 2	2 2 2 2	3 3 3	3 3 3	
COs CO1 CO2 CO3 CO4	PO1 3 3 3 3 3	2 2 2 2 2	2 2 2 2 2	3 3 3 3	2 2 2 2 2 2	2 2 2 2 2	2 2 2 2 2	2 2 2 2 2	3 3 3 3	3 3 3 3	
COs CO1 CO2 CO3 CO4 Average	PO1 3 3 3 3 3 3	2 2 2 2 2 2	2 2 2 2 2	3 3 3 3	2 2 2 2 2 2	2 2 2 2 2	2 2 2 2 2	2 2 2 2 2	3 3 3 3	3 3 3 3	
COs CO1 CO2 CO3 CO4 Average Course C	PO1 3 3 3 3 3 2 0 0 0 1 0	2 2 2 2 2 2	2 2 2 2 2	3 3 3 3 3	2 2 2 2 2 2	2 2 2 2 2 2	2 2 2 2 2 2 2	2 2 2 2 2 2	3 3 3 3 3	3 3 3 3 3	
COs CO1 CO2 CO3 CO4 Average Course C	PO1 3 3 3 3 3 Conter Hours/V	2 2 2 2 2 2 2	2 2 2 2 2	3 3 3 3 3	2 2 2 2 2 2 2 000000000000000000000000	2 2 2 2 2 2	2 2 2 2 2 2 2 P (Hours/W	2 2 2 2 2 2	3 3 3 3 3 Total Hour	3 3 3 3 3	
COs CO1 CO2 CO3 CO4 Average Course C L ()	PO1 3 3 3 3 3 3 Conter Hours/V 3	2 2 2 2 2 2 2	2 2 2 2 2	3 3 3 3 3	2 2 2 2 2 2	2 2 2 2 2 2	2 2 2 2 2 2 2 P (Hours/W	2 2 2 2 2 2	3 3 3 3 3	3 3 3 3 3	
COs CO1 CO2 CO3 CO4 Average Course C L (1 Uni	PO1 3 3 3 3 3 3 Conter Hours/V 3	2 2 2 2 2 2 2 Meek)	2 2 2 2 2 2	3 3 3 3 3 T (He	2 2 2 2 2 2 2 0 0	2 2 2 2 2 2	2 2 2 2 2 2 2 2 2 P (Hours/W 0 Content	2 2 2 2 2 2 2	3 3 3 3 3 7 7 0 7 0 7 0 1 8 0 9 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	3 3 3 3 3 */Week	
COs CO1 CO2 CO3 CO4 Average Course C L ()	PO1 3 3 3 3 3 3 Conter Hours/V 3	2 2 2 2 2 2 mt: Week)	2 2 2 2 2	3 3 3 3 3 T (He	2 2 2 2 2 2 2 2 0 0 0 er, veh	2 2 2 2 2 2 2 2 eek)	2 2 2 2 2 2 2 2 P (Hours/W 0 Content nd roadway	2 2 2 2 2 2 2 7 (C1,R	3 3 3 3 3 3 Total Houn 3 emember);Un	3 3 3 3 3 x/Week	
COs CO1 CO2 CO3 CO4 Average Course C L (1	PO1 3 3 3 3 3 3 Conter Hours/V 3	2 2 2 2 2 2 Meek)	2 2 2 2 2 2 efine R chicle	3 3 3 3 3 T (He	2 2 2 2 2 2 0 0 0 er, veh eristics	2 2 2 2 2 2 eek) iicle, an (C2,Ur	2 2 2 2 2 2 2 P (Hours/W 0 Content nd roadway iderstand);	2 2 2 2 2 2 7 (c1,R IRC s	3       3       3       3       3       3       a       a       b       a       a       b       a       a       b       a       a       b       a       a       b       a       b       a       b       b       a       b       a       b       b       a       b       b       b       b       b       b       a       b       b       b       b       b       b       b       b       b       b       b       b       b       b       b       b       b       b       b       b       b       b       b       b       b       b       b       b       b <t< th=""><th>3 3 3 3 3 c/Week</th></t<>	3 3 3 3 3 c/Week	
COs CO1 CO2 CO3 CO4 Average Course C L (1	PO1 3 3 3 3 3 3 Conter Hours/V 3	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2 2 2 2 2 2 2 5 fine R chicle ceed, an	3 3 3 3 3 T (He characte	2 2 2 2 2 2 2 2 2 2 0 0 er, veh eristics c volun	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2 2 2 2 2 2 2 2 2 2 (C1,R IRC s rstand 1	3       3       3       3       3       3       a       a       b       a       a       b       a       a       b       a       a       b       a       a       b       a       a       b       b       a       a       b       a       a       b       b       a       b       b       a       b       b       a       b       a       b       b       a       b       b       b       b       b       b       b       b       b       b       b       b       b       b       b       b       b       b       b       b       b       b       b       b <t< th=""><th>3 3 3 3 3 c/Week derstand Design acity and</th></t<>	3 3 3 3 3 c/Week derstand Design acity and	
COs CO1 CO2 CO3 CO4 Average Course C L (1	PO1 3 3 3 3 3 3 Conter Hours/V 3	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	3 3 3 3 3 T (He coad use characte d traffic f servic	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2 2 2 2 2 2 2 2 (C1,R IRC s rstand pacity	3       3       3       3       3       3       3       a       a       a       b       a       a       a       b       a       a       a       b       a       a       a       b       a       a       a       a       b       a       a       a       a       b       a       a       b       a       b       a       a       a       b       a       b       a       b       a       b       a       b       a       b       a       a       a       a       a       a       a       a       a       a       a       a       a       a       a       a <t< th=""><th>3 3 3 3 3 r/Week derstand Design acity and ad rural</th></t<>	3 3 3 3 3 r/Week derstand Design acity and ad rural	
COs CO1 CO2 CO3 CO4 Average Course C L (1	PO1 3 3 3 3 3 3 Conter Hours/V 3	2 2 2 2 2 2 2 2 Veek)	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	3 3 3 3 3 T (He coad use characte d traffic f servic ,Underst	2 2 2 2 2 2 2 0 0 er, veh eristics volun ce dete tand);E	2 2 2 2 2 2 eek) iicle, au (C2,Ur ne(C3,A erminat Define	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2 2 2 2 2 2 2 2 (C1,R IRC s rstand pacity	3       3       3       3       3       3       3       a       a       a       b       a       a       a       b       a       a       a       b       a       a       a       b       a       a       a       a       b       a       a       a       a       b       a       a       b       a       b       a       a       a       b       a       b       a       b       a       b       a       b       a       b       a       a       a       a       a       a       a       a       a       a       a       a       a       a       a       a <t< th=""><th>3 3 3 3 3 c/Week derstand Design acity and</th></t<>	3 3 3 3 3 c/Week derstand Design acity and	
COs CO1 CO2 CO3 CO4 Average Course C L (1 Uni 1.	PO1 3 3 3 3 3 3 Conter Hours/V 3	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	3 3 3 3 3 3 T (He characte d traffic f servic ,Underst as(C1,Re	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	3       3       3       3       3       3       3       emember);Un       tandards for       Highway capa       of urban and concept	3         3         3         3         3         3         4         6         6         6         7         0         10         10         11         12         13         13         14         15         15         16         17         17         18         10         11         12         13         14         15	
COs CO1 CO2 CO3 CO4 Average Course C L (1	PO1 3 3 3 3 3 3 Conter Hours/V 3	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	3 3 3 3 3 3 T (He coad use characte d traffic f servic ,Undersi us(C1,Re coad use	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	3       3       3       3       3       3       3       a       a       a       b       a       a       a       b       a       a       a       b       a       a       a       b       a       a       a       a       b       a       a       a       a       b       a       a       b       a       b       a       a       a       b       a       b       a       b       a       b       a       b       a       b       a       a       a       a       a       a       a       a       a       a       a       a       a       a       a       a <t< th=""><th>3 3 3 3 3 7/Week derstand Design acity and and rural and its acks and</th></t<>	3 3 3 3 3 7/Week derstand Design acity and and rural and its acks and	

design Road user facilities like Parking facilities, Cycle tracks and



Guru Gobind Singh Tricentenary University
cycle-ways and Pedestrian facilities(C2, Understand, C6,Create);
Explain Road inventory(C2,Understand); Discuss Accident
studies(C2,Understand);
Define Cross-sectional elements(C1,Remember); Define Stopping and
passing sight distance(C1,Remember);Design of Horizontal and

	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
3.	Define Cross-sectional elements(C1,Remember); Define Stopping and
	passing sight distance(C1,Remember);Design of Horizontal and
	Vertical curves(C6,Create). Construction of Hill Roads(C6,Create);
4.	Differentiate between Signs and markings(C4, Analyzed); Describe
	Traffic System Management(C2,Understand); Define at-grade
	intersections and its type(C1,Remember); Understand Channelization of
	traffic(C2,Understand); Design of rotaries(C6,Create);Understand the
	function of Traffic signals - pre-timed and traffic
	actuated(C2,Understand); Design of signal setting - phase diagrams,
	<pre>timing diagram(C6,Create);developing Signal co-ordination(C6,Create);</pre>

# **Teaching - Learning Strategies and Contact Hours**

Teaching - Learning Strategies	Contact Hours
Lecture	35
Practical	
Seminar/Journal Club	
Small group discussion (SGD)	
Self-directed learning (SDL) / Tutorial	
Problem Based Learning (PBL)	4
Case/Project Based Learning (CBL)	4
Revision	2
Others If any:	
Total Number of Contact Hours	45

Formative	Summative
Multiple Choice Questions (MCQ)	Mid Semester Examination 1
Viva-voce	Mid Semester Examination 2
<b>Objective Structured Practical Examination</b>	University Examination
Quiz	Dissertation
Seminars	Multiple Choice Questions (MCQ)
Problem Based Learning (PBL)	Short Answer Questions (SAQ)
Journal Club	Long Answer Question (LAQ)
	Practical Examination & Viva-voce
	Objective Structured Practical Examination



Nature of Assessment		CO1	CO2	CO3	CO4
Quiz					
VIVA			<ul> <li>✓</li> </ul>		✓
Assignment / Prese	entation	✓	<ul> <li>✓</li> </ul>	✓	$\checkmark$
Unit test		✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓
Practical Log Bool	k/ Record Book				
Mid Semester Example	mination 1	✓	<ul> <li>✓</li> </ul>	✓	✓
Mid Semester Example	mination 2	✓	<ul> <li>✓</li> </ul>	✓	✓
University Examin	ation	✓	<ul> <li>✓</li> </ul>	✓	✓
Feedback Process		1. Stu	ident's Fe	edback	
Students Feedback	is taken through	various	steps		
1. Regular fee	dback through M	lentor M	entee sys	tem	
	etween the seme	ster throu	ıgh googl	e forms	
<b>References:</b>					
	Text Books				
	1. KW Ogde	n, Safe	r Roads	: A G	uide to Road Safety
					ss, Ash gate Publishers,
	1996.		-		-
	2. Rune Elvik	and T	rulsVaa,	the Han	dbook of Road Safety
	Measures, H		2004.		
	Reference boo			~ .	
					Serving Society, 2004.
					After Studies in Road
	Safety, Pergame		,		.002).
	3. Highway Saf	ety Man	uai (HSM	l).	



			Fac	ulty of I	Engine	ering &	& Technolog	gy		
Name of th	ne Dep	artmer	nt	Civ	Civil Engineering					
Name of th	ne Prog	gram		Ma	Master of Technology in Civil Engineering					
						Engineering)				
Course Co	ode			131	160359					
Course Tit	tle			Hig	ghway	Const	ruction Prac	ctices		
Academic	Year			II						
Semester				III						
Number of	f Cred	its		3						
<b>Course Pr</b>	erequi	site								
Course Sy	nopsis			Em	bankm	ent co	nstruction,	WBM	& WMM, D	ry lean
				con	ncrete	and	cement trea	ated ba	ase, Concret	e road
				cor	structi	on, Roa	ad constructi	on in m	ountainous reg	gion
Course Ou	itcome	·C•				,			· · · · ·	<u></u>
At the end			student	s will be	e able t	0:				
							subgrade, u	nbound	, and bound g	oranular
CO1		vers.	00115010	we choir p	loccuu	105 101	subgraue, a	ine o una	, una couna g	Junana
CO2		/	e strate	gies to r	oroduce	e optim	al bituminou	ıs mixes	_	
									ninous and c	concrete
CO3		yers.	-pprop			non p				
			ppropr	iate pay	ement	quality	v control tes	st. and	quantify cons	truction
CO4		riability		···· 1		1	,			
Mapping of Outcomes		rse Ou	tcomes	s (COs)	to Pro	gram (	Outcomes (F	<b>POs) &amp;</b> ]	Program Spe	cific
COs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
C01		1	2	3	1	2	2	2	3	3
CO2		1	2	3	1	2	2	2	3	3
CO3		1	2	3	1	2	2	2	3	3
CO4		1	2	3	1	2	2			-
							2	2		3
Average		4	2	3	1		-	2	3	3
Average		1	2	3	1	2	2	2	3	3 3
	Conte	1	2	3	1		-			
Course C		1 nt:	2	T		2	2	2	3	3
Course C	Hours/V	1 nt:	2	T	ours/We	2	2 P (Hours/W	2	3 Total Hour	3
Course C	Hours/V 3	1 nt:	2	T		2	2 P (Hours/W 0	2	3	3
Course C L ( Un	Hours/V 3 it	1 nt: Week)		T (H	ours/We	2 eek)	2 P (Hours/W 0 Content	2 Veek)	3 Total Hour 3	3 /Week
Course C	Hours/V 3 it	1 nt: Week)	escribe	T (H	ours/Wo 0 nation	2 eek) cutting	2 P (Hours/W 0 Content in Soil and	2 Week) hard ro	3 Total Hour	3 /Week erstand),
Course C L ( Un	Hours/V 3 it	1 mt: Week) De Inv	escribe	T (H the forr e the p	ours/We 0 mation preparat	2 eek) cutting ion of	2 P (Hours/V 0 Content in Soil and Sub-grade	Veek) hard ro (C6, Cro	3 Total Hour 3 Dock (C2, Under	3 /Week erstand), ground
Course C L ( Un	Hours/V 3 it	1 mt: Week) De Inv im	escribe vestigat provem	<b>T</b> ( <b>H</b> the forr e the p ent, Reta	ours/Wo 0 mation preparat	2 eek) cutting ion of nd Brea	2 P (Hours/V 0 Content in Soil and Sub-grade ( st walls on hi	2 Veek) hard ro (C6, Cro Il roads (	3 Total Hour, 3 Dock (C2, Undeate), Explain	3 /Week erstand), ground d)
Course C L ( Un 1.	Hours/V 3 it	1 mt: Week) De Inv im De	escribe vestigat provem	T (H the forr e the p ent, Reta the Sub	ours/Wo 0 mation preparat aining a – base	2 eek) cutting ion of nd Brea / base (	2 P (Hours/W 0 Content in Soil and Sub-grade ( st walls on hi C2, Understa	2 Veek) hard ro (C6, Cro 11 roads ( ind), con	3 Total Hour 3 Dock (C2, Understand (C2, Understand	3 /Week erstand), ground d) r Bound
Course C L ( Un 1.	Hours/V 3 it	1 Meek) Dee Inv im Dee Ma	escribe vestigat provem escribe	T (H the forr e the p ent, Reta the Sub	ours/Wo 0 mation preparat aining a – base , Wet	2 cutting ion of nd Brea / base ( Mix Ma	2 P (Hours/V 0 Content in Soil and Sub-grade ( st walls on hi C2, Understa acadam (WM	2 Veek) hard ro (C6, Cro 11 roads ( ind), con	3 Total Hour 3 ock (C2, Understand pare the Wate	3 /Week erstand), ground d) r Bound



3.	Differentiate the different types of Bituminous Constructions (C4, Analyze), Interface Treatments, Examine the Bituminous Surfacing and wearing Courses for roads and bridge deck slabs (C4, Analyze), Selection of wearing Course under different Climatic and Traffic conditions as per IRC specifications (C5, Evaluate), Compare the different construction techniques and Quality Control (C4, Analyze)
4.	Test on Concrete mixes (C4, Analyze), Classify the construction equipment (C2, Understand), Compare the different methods of construction of joints in concrete pavements (C4, Analyze), Investigate the quality Control in Construction of Concrete pavements (C6, Create), Describe Overlay Construction (C2, Understand).

Teaching - Learning Strategies	Contact Hours
Lecture	35
Practical	
Seminar/Journal Club	
Small group discussion (SGD)	
Self-directed learning (SDL) / Tutorial	
Problem Based Learning (PBL)	4
Case/Project Based Learning (CBL)	4
Revision	2
Others If any:	
Total Number of Contact Hours	45

Formative	Summative
Multiple Choice Questions (MCQ)	Mid Semester Examination 1
Viva-voce	Mid Semester Examination 2
Objective Structured Practical Examination	University Examination
Quiz	Dissertation
Seminars	Multiple Choice Questions (MCQ)
Problem Based Learning (PBL)	Short Answer Questions (SAQ)
Journal Club	Long Answer Question (LAQ)
	Practical Examination & Viva-voce
	Objective Structured Practical Examination



Nature of Assessm	nent	CO1	CO2	CO3	CO4
Quiz					
VIVA					
Assignment / Prese	entation	✓	<b>√</b>	<ul> <li>✓</li> </ul>	✓
Unit test		<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓
Practical Log Book	x/ Record Book				
Mid Semester Example	nination 1	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓
Mid Semester Example	mination 2	✓	<b>√</b>	<ul> <li>✓</li> </ul>	✓
University Examin	ation	✓	<b>√</b>	<ul> <li>✓</li> </ul>	✓
Feedback Process		3. Stu	ident's Fe	edback	
Students Feedback	is taken through	various	steps		
	dback through M				
	etween the seme	ster throu	igh googl	e forms	
<b>References:</b>					
	Text Books:				
	1	-	0		ggDr. L. R. Kadiyali&
	Dr. N. B. L				
	· · ·				nd Bridge Work (4th
		•	of Road 🛛	Fransport	and Highways, 2001.
	<b>Reference Boo</b>				
		•		•	The Location, Design,
		,	laintenan	ce of P	avements, Butterwsorth
	Heinemann				
	2. R. N. Hun Thomas Tel				in Road Construction,



Faculty of Engineering & Technology					
Name of the Department	Civil Engineering				
Name of the Program	Master of Technology in Civil Engineering				
	(Transportation Engineering)				
Course Code	13160369				
Course Title	Pavement Evaluation, Rehabilitation & Maintenance				
Academic Year	Π				
Semester	III				
Number of Credits	3				
Course Prerequisite					
Course Synopsis	Pavement distresses, Pavement rehabilitation techniques,				
	Overlay design, Pavement maintenance				
Course Outcomes:					

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

**CO1** Evaluate pavement based on surface conditions.

CO2	Assess structural strength of pavements.
CO3	Select appropriate pavement rehabilitation options.
CO4	Prioritize pavement maintenance strategies.

Mapping of Course Outcomes (COs) to Program Outcomes (POs) & Program Specific Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	3	3	3	2	2	3	3
CO2	2	1	2	2	3	3	2	2	3	3
CO3	3	3	3	2	3	2	2	2	3	3
CO4	3	2	2	2	1	1	2	2	3	3
Average	2.75	2	2	2.25	2.5	2.25	2	2	3	3

# **Course Content:**

L (Hours/Wee	k)	T (Hours/Week)	P (Hours/Week)	Total Hour/Week					
3		0	0	3					
Unit			Content						
1.	Define v	various pavement d	istresses and its ty	ypes (C1,Remember);					
	Evaluate	and understand to	echniques for func	tional and structural					
	evaluatio	evaluation of pavements (network survey vehicle, FWD, Retro reflecto-							
	meter) a	meter) and bridge (mobile bridge inspection unit)(C2,Understand,							
	C4,Analy	C4, Analyzed, C5, Evaluate);							
2.	Network and project survey and evaluation (C5,Evaluate, C6,Create),								
	Understa	Understand and analyze various pavement rehabilitation							
	technique	techniques(C2,Understand, C4,Analyzed).							
3.	Understa	Understand Overlay design procedures(C2,Understand);feasibility study							
	of recycli	ng flexible and rigid	pavements(C4,Anal	yzed, C5,Evaluate);					
4.	Maintena	nce of paved and un	paved roads(C3,App	ly); Pavement					



stand);							
Teaching - Learning Strategies and Contact Hours							
Contact Hours							
35							
4							
4							
2							
45							

## **Assessment Methods:**

Formative	Summative
Multiple Choice Questions (MCQ)	Mid Semester Examination 1
Viva-voce	Mid Semester Examination 2
<b>Objective Structured Practical Examination</b>	University Examination
Quiz	Dissertation
Seminars	Multiple Choice Questions (MCQ)
Problem Based Learning (PBL)	Short Answer Questions (SAQ)
Journal Club	Long Answer Question (LAQ)
	Practical Examination & Viva-voce
	Objective Structured Practical Examination

Nature of Assessment	CO1	CO2	CO3	CO4
Quiz				
VIVA		<ul> <li>✓</li> </ul>		$\checkmark$
Assignment / Presentation	✓	<ul> <li>✓</li> </ul>	✓	$\checkmark$
Unit test	✓	<ul> <li>✓</li> </ul>	✓	$\checkmark$
Practical Log Book/ Record Book				
Mid Semester Examination 1	✓	✓	✓	✓
Mid Semester Examination 2	✓	<ul> <li>✓</li> </ul>	✓	$\checkmark$
University Examination	✓	<ul> <li>✓</li> </ul>	✓	✓
Feedback Process	2. Stu	dent's Fe	edback	
Students Feedback is taken through	various	steps		



NAAC
A+/

3.	Regular	feedback	through	Mentor	Mentee system	
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4.	Feedback	between	the	semester	through	google forms
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	666
<b>References:</b>	
	Text/Reference Books
	1. Flexible Pavement Rehabilitation and Maintenance,
	Prithvi S. Kandhal, Mary Stoup Gardiner, American
	Society for Testing & Materials publication.
	2. Construction and Rehabilitation of Concrete Pavements
	Under Traffic, ShreenathRao, Deepak Raghunathan, TRB.
	3. STP1348; Flexible Pavement Rehabilitation and
	Maintenance.



			Faci	ulty of I	Engine	ering 8	k Technolog	gy			
Name of th	ie Dep	artmer	nt	Civ	Civil Engineering						
Name of th	ie Prog	gram			Master of Technology in Civil Engineering						
							Ingineering)		C		
Course Code					60363		0 0,				
Course Title					vironn	nent Im	pact Assess	sment			
Academic	Year			II			•				
Semester				III							
Number of	f Credi	ts		3							
Course Pr	erequi	site									
Course Sy				Un	derstan	ding th	e importanc	e of en	vironmental e	effect of	
·	•					-	-		valuating the		
				•			1 0		rstanding the		
							1 0		U		
				-	-		_	-	aluation and		
						-			nathematical		
					vironm	ental In	npact Assess	sment, C	Carbon trading	,	
Course Ou											
At the end of the course students will be able to:											
CO1									professionals		
									tructure proje		
CO2				method		-		1		ssments,	
					evaluation, risk management and remediation techniques						
				t of pred							
CO3									luding techni	ques of	
<u> </u>		_	_	_	ting and carbon trading will be illustrated ous legal guidelines for environment safety						
CO4					0 0					1.01	
		rse Out	tcomes	(COs)	to Pro	gram (	Dutcomes (P	Os) & .	Program Spe	cific	
Outcomes											
COa	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO	2 PSO3	PSO4	
COs	FOI	F02	105	104	105	100	1501	1504	1505	1304	
CO1	2	2	1	1	2	2	2	2	3	3	
CO2	2	2	1	1	2	2	2	2	3	3	
CO3	2	2	1	1	2	2	2	2	3	3	
<b>CO4</b>	2	2	1	1	2	2	2	2	3	3	
Average	2	2	1	1	2	2	2	2	3	3	
			1		1		-		1	<u> </u>	
Course C	Conter	nt:									
	Hours/V			ТШ	ours/We	eek)	P (Hours/W	Veek)	Total Hour	/Week	
	<u>110ur 5/ v</u> 3	(UN)		11) 1	0			(UK)	3	TUCK	
Un	-			<u> </u>	U	1	Content		5		
1.		Ur	derstan	d Tech	nical a	nd pro		cts of	Environmental	Impact	
1.									rstand, Guidel		
dssessment (C						,	,		,		



	legal aspects of environmental protection (C1, Remember, C2, Understand)
2.	General Framework for characterizing environmental dislocation and
	disruption due to pollution (C4, Analyze)
3.	Theory and application of mathematical models: - Mathematical
	modelling for water quality systems, Stream and Estuarine models for
	pollution control (C4, Analyze, C6, Create)
4.	Examine Socio economic aspects (C4, Analyze), Evaluate various
	Measures of effectiveness of pollution control activities (C5, Evaluate),
	understand effect of Inter-sector pollutant transfers (C2, Understand),
	determine total impact assessment (C5, Evaluate)

Teaching - Learning Strategies	Contact Hours	
Lecture	35	
Practical		
Seminar/Journal Club		
Small group discussion (SGD)		
Self-directed learning (SDL) / Tutorial		
Problem Based Learning (PBL)	4	
Case/Project Based Learning (CBL)	4	
Revision	2	
Others If any:		
Total Number of Contact Hours	45	

Formative	Summative
Multiple Choice Questions (MCQ)	Mid Semester Examination 1
Viva-voce	Mid Semester Examination 2
Objective Structured Practical Examination	University Examination
Quiz	Dissertation
Seminars	Multiple Choice Questions (MCQ)
Problem Based Learning (PBL)	Short Answer Questions (SAQ)
Journal Club	Long Answer Question (LAQ)
	Practical Examination & Viva-voce
	Objective Structured Practical Examination



Nature of Assessm	CO1	CO2	CO3	CO4		
Quiz						
VIVA						
Assignment / Pres	entation	<ul> <li>✓</li> </ul>	✓	✓	✓	
Unit test		<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓	
Practical Log Bool	k/ Record Book					
Mid Semester Exa	mination 1	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓	✓	
Mid Semester Exa	mination 2	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓	
University Examin	ation	✓	✓	✓	✓	
Feedback Process Students Feedback 5. Regular fee	various s lentor M	entee syst	tem			
6. Feedback b	between the semes	ster throu	ıgh googl	le forms		
	<ul> <li>Text Books:</li> <li>1. L. W. Canter, Environmental Impact Assessment, 2nd Ed., McGraw-Hill, 1997.</li> <li>2. P. Judith and G. Eduljee, Environmental Impact Assessment for Waste Treatment and Disposal Facilities, John Wiley &amp; Sons, 1994.</li> <li>Reference Books:</li> <li>1. G. Burke, B. R. Singh and L. Theodore, Handbook of Environmental Management and Technology, 2nd Ed., John Wiley &amp; Sons, 2000.</li> <li>2. K. Whitelaw and Butterworth, ISO 14001: Environmental System Handbook, 1997.</li> <li>3. R. Welford, Corporate Environmental Management - Systems and Strategies, Universities Press, 1996.</li> </ul>					



	Faculty of Engineering & Technology					
Name of the L	Department Civil Engineering					
Name of the P	Program	Master of Technology in Civil Engineering				
		(Transportation Engineering)				
<b>Course Code</b>		13160365				
<b>Course Title</b>		Bridge Engineering				
Academic Yea	ar	II				
Semester	Semester III					
Number of Ci	f Credits 3					
<b>Course Preree</b>	Course Prerequisite NIL					
Course Synop	osis	Bridge Aesthetics, Analyzing techniques, Pre-stress concrete,				
		Steel bridge, Bridge in service				
Course Outco	mes:					
At the end of t	he course students w					
CO1	Understanding the importance of bridge aesthetics					
CO2	Understanding the various components and there importance in bridge					
CO3	Understanding the v	various kind of loading on bridge				
CO4	Use of concrete and	steel bridge and their maintenance				

Mapping of Course Outcomes (COs) to Program Outcomes (POs) & Program Specific Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2	2	2	2	2	3	3
CO2	3	2	2	2	2	2	2	2	3	3
CO3	3	2	2	2	2	2	2	2	3	3
CO4	3	2	2	2	2	2	2	2	3	3
Average	3	2	2	2	2	2	2	2	3	3

# **Course Content:**

L (Hours/Wee	k)	T (Hours/Week)	P (Hours/Week)	<b>Total Hour/Week</b>
3		0	0	3
Unit		Content		Competencies
1	Introduct	ion, Planning, Aest	thetics and Bridge,	C1
	Road brid	lges, Loading and IR	C codes	C2
				C3
				C4
2	Slab Brid	lges and RCC T Bear	m Bridges, Different	C1
	analysis	techniques-finite el	C2	
	finite diff	erence. Grillage anal	C3	
3	Pre-stress	sed Concrete I Gi	C1	
	Girder	Bridges and Segm	C2	
	Bridges,	Substructures includi	C3	
4	Railway	Bridges and IRS cod	es, Steel bridges:	C1



Truss Bridges and Plate	Girder Bridges C2
	C3
<b>Teaching - Learning Strategies and Contact</b>	Hours
<b>Teaching - Learning Strategies</b>	Contact Hours
Lecture	28
Practical	
Seminar/Journal Club	
Small group discussion (SGD)	
Self-directed learning (SDL) / Tutorial	
Problem Based Learning (PBL)	6
Case/Project Based Learning (CBL)	6
Revision	2
Others If any:	
Total Number of Contact Hours	42
Assessment Methods:	

Assessment Wethous.						
Formative	Summative					
Multiple Choice Questions (MCQ)	Mid Semester Examination 1					
Viva-voce	Mid Semester Examination 2					
Objective Structured Practical Examination	University Examination					
Quiz	Dissertation					
Seminars	Multiple Choice Questions (MCQ)					
Problem Based Learning (PBL)	Short Answer Questions (SAQ)					
Journal Club	Long Answer Question (LAQ)					
	Practical Examination & Viva-voce					
	Objective Structured Practical Examination					

Nature of Assessment	C01	CO2	CO3	CO4
Quiz				
VIVA		<ul> <li>✓</li> </ul>		✓
Assignment / Presentation	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓
Unit test	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓
Practical Log Book/ Record Book				
Mid Semester Examination 1	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓
Mid Semester Examination 2	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓
University Examination	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓
Feedback Process	3. Student's Feedback			



Students Feedback	is taken through various steps				
5. Regular fee	dback through Mentor Mentee system				
6. Feedback be	etween the semester through google forms				
<b>References:</b>					
	Text/Reference Books				
	1. Relevant IRC & IRS codes.				
	2. N. Krishna Raju, "Design of Bridge", Oxford & Ibh. (ISBN				
	8120417984).				
	3. Johnson Victor," Essentials Of Bridge Engineering",				
	Oxford &Ibh, 2016.				
	4. Krishna Raju, "Prestressed Concrete", McGraw Hill				
	Education; Sixth edition.				



# Master of Technology in Civil Engineering (Structural Engineering) 3<sup>rd</sup> Semester



		]	Facult	y of Eng	gineerin	ig & Te	chnolo	gv		
Name of the Department			Civil Engineering							
Name of the Program				Master of Technology in Civil Engineering (Structural						
0				eering)	0.		U	U V		
<b>Course Code</b>				13160	U,					
<b>Course Title</b>				Theor	v and I	Design	of Plate	es & She	lls	
Academic Ye	ar			II	5	8				
Semester				III						
Number of C	redits			4						
Course Prere		•		Struct	ure Mec	hanics				
Course Syno	-	-					ent will	learn a	bout T	hin plates its
	0313									bending and
				-			•			d detailing of
				U	plate st			· ut	Sign and	
Course Outco	omes.			101000	Plate St		•			
At the end of		rse stud	lents v	vill be at	ole to:					
CO1	1					and Lev	v's met	thod.		
CO2		-	the plates using Navier's and Levy's method. The circular, rectangular and square plates by finite difference method.							
CO2			the curved shells and roofs.							
CO4				folded p						
	, v			*			amag ()	D() 8- 1	Ducano	m Specific
Mapping of ( Outcomes:	Jourse	Outcol	mes (C	<b>JUS</b> ) 10 1	Progra		comes (	PUS) & I	Prograi	in specific
Outcomes:										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
005	101	102	100	101	100	100	1001	1502	1000	1501
CO1	1	-	3	3	3	3	1	-	3	3
CO2	1	-	3	3	3	3	1	-	3	3
CO3	1	-	3	3	3	3	1	-	3	3
CO4	1	-	3	3	3	3	1	-	3	3
Average	1	-	3	3	3	3	1	-	3	3
					•					
<b>Course Con</b>	ntent:									
	urs/Wee	<b>k</b> )		T (Hours	s/Week)	Р	(Hours/V	Week)	Total	Hour/Week
(110)	3	)		1	· · · ·		0	( • • • • • • • •	2000	4
Unit	•			_		Co	ntent			-
1		Defin	e thin	plate an	d shells			er), desc	ribe La	terally loaded
_		Define thin plate and shells (C1, Remember), describe Laterally loaded thin plates (C2, Understand), Formulate the differentiate equation and						-		
boundary conditions (C6, Create)							1			
		bound								
2					· · ·	,	Underst	tand), Co	ompare	the Navier's
2		Expla	in Be	nding o	f plates	(C2,				
2		Expla soluti	in Be on and	nding o l Levy's	f plates method	(C2, 1 (C4, A	Analyze	), Descri	be Rect	angular plates
2		Expla solution with v	in Be on and various	nding o l Levy's s edge co	f plates method ondition	(C2, l (C4, A s and S	Analyze) ymmeti	), Descri rical bend	be Recta	



	square and rectangular plates (C6, Create)
3	Classify the shells (C2, Understand), Interpret the structural action of
	shells (C3, Apply), Beam method of analysis (C4, Analyze)
4	Analysis and design of doubly curved shells and Elliptic parabolic (C4,
	Analyze), Compare Conoid and hyperbolic paraboloid roofs (C4,
	Analyze)

Teaching - Learning Strategies	Contact Hours	
Lecture	28	
Practical		
Seminar/Journal Club		
Small group discussion (SGD)		
Self-directed learning (SDL) / Tutorial	25	
Problem Based Learning (PBL)		
Case/Project Based Learning (CBL)		
Revision	07	
Others If any:		
Total Number of Contact Hours	60	

#### **Assessment Methods:**

Formative	Summative					
Multiple Choice Questions (MCQ)	Mid Semester Examination 1					
Viva-voce	Mid Semester Examination 2					
Objective Structured Practical Examination	University Examination					
Quiz	Dissertation					
Seminars	Multiple Choice Questions (MCQ)					
Problem Based Learning (PBL)	Short Answer Questions (SAQ)					
Journal Club	Long Answer Question (LAQ)					
	Practical Examination & Viva-voce					
	Objective Structured Practical Examination					

Nature of Assessment	CO1	CO2	CO3	CO4	
Quiz					
VIVA					
Assignment / Presentation	✓	✓	✓	✓	
Unit test	✓	✓	✓	✓	
Practical Log Book/ Record Book					
Mid Semester Examination 1	✓	✓	✓	✓	
Mid Semester Examination 2	✓	✓	✓	✓	
University Examination	✓	✓	✓	✓	



Feedback Process		2. Student's Feedback		
Students Feedback is	steps			
1. Regular feedb	ack through Mentor Men	entee system		
2. Feedback betw	ween the semester throug	gh google forms		
<b>References:</b>				
	Text Books			
	1. G. S. Ramaswamy, (19	1996), Design and Construction of Concrete Shell		
	Roofs, First Edition, CBS Publishers and distributors. ISBN-13:			
	9780812390995.			
	<b>Reference Books</b>			
	1. Timoshenko and Krieg	eger, (2010), Theory of Plates and Shells, Second		
	Edition, Tata McGraw H	Hill Education Pvt. Ltd., ISBN-13:		
	2. K. Bhaskar, (2013), Pl	Plates: Theories and Applications, First Edition,		
	Ane Books Pvt. Ltd., ISI	SBN-13: 9789382127024.		



# Master of Technology in Civil Engineering (Structural Engineering)

# Departmental Electives



		I	Facult	v of En	gineer	rıng ð	<b>k</b> Technolo	gv		
Name of the	Depart			Civil Engineering						
Name of the	-			Master of Technology in Civil Engineering (Structural						
	8				neering		8,	8		
<b>Course Code</b>				1316		<u>,</u>				
Course Title						ted St	ructures			
	Academic Year						iuctures			
Semester	ul			II III						
Number of C	3									
Course Prere	-	rete te	chnolo	סע						
Course Synopsis						student	will le	arn abo	out types of	
Course Syno	para					,				
							efabrication	•		
							0			Dimensioning
				and d	letailin	g of jo	oints, Desig	gn of pre	e fabricat	ted Modules.
<b>Course Outco</b>	omes:									
At the end of	the cou	rse stuc	lents v	vill be a	ble to:					
CO1	Know	the typ	bes of	prefabr	icatior	ı syste	ems.			
CO2	Unde	rstand t	he beh	aviour	of she	ll stru	ctures.			
		gn pre-fabricated Modules.								
CO2 CO3		n pre-fa	abricat	ed Mo	dules.					
CO3 CO4	Desig Do th	e detail	ing of	pre-fat	oricated				Ducano	m Encoific
CO3 CO4 Mapping of O Outcomes:	Desig Do th Course	e detail Outco	ing of mes (C	pre-fat COs) to	pricated Prog	ram C	Outcomes (			
CO3 CO4 Mapping of (	Desig Do th	e detail	ing of	pre-fat	oricated			POs) &	Program	m Specific PSO4
CO3 CO4 Mapping of O Outcomes:	Desig Do th Course	e detail Outco	ing of mes (C	pre-fat COs) to	pricated Prog	ram O PO6 3	Outcomes (			
CO3 CO4 Mapping of O Outcomes: COs	Desig Do th Course PO1	e detail Outcor PO2	ing of mes (C PO3	pre-fab COs) to PO4	Progr	ram C PO6	Dutcomes () PSO1		PSO3	PSO4
CO3 CO4 Mapping of C Outcomes: COs CO1	Desig Do th Course PO1 1	e detail Outcor PO2 -	ing of mes (C PO3 3	pre-fat COs) to PO4 3	PO5	ram C PO6 3 3 3	Dutcomes () PSO1 1	PSO2	PSO3	PSO4 3 3 3 3
CO3 CO4 Mapping of C Outcomes: COs CO1 CO2	Desig Do th Course PO1 1 1	e detail Outcor PO2 - -	res (C PO3 3 3	pre-fab COs) to PO4 3 3	PO5 3 3	ram () PO6 3 3	Dutcomes () PSO1 1 1	PSO2	PSO3 3 3	PSO4 3 3
CO3 CO4 Mapping of C Outcomes: COs CO1 CO2 CO3	Desig Do th Course PO1 1 1 1	e detail Outcor PO2 - -	ing of mes (C PO3 3 3 3 3	pre-fab           COs) to           PO4           3           3           3	PO5 3 3 3	ram C PO6 3 3 3	Dutcomes () PSO1 1 1 1	PSO2	PSO3 3 3 3 3	PSO4 3 3 3 3
CO3 CO4 Mapping of C Outcomes: COs CO1 CO2 CO3 CO4 Average	Desig Do th Course PO1 1 1 1 1 1 1	e detail Outcor PO2 - - - -	ing of mes (C PO3 3 3 3 3 3	pre-fab           COs) to           PO4           3           3           3           3           3	PO5 3 3 3 3	ram C PO6 3 3 3 3	PSO1           1           1           1           1           1           1	PSO2	PSO3 3 3 3 3	PSO4 3 3 3 3 3
CO3 CO4 Mapping of C Outcomes: COs CO3 CO2 CO3 CO4 Average Course Con	Desig Do th Course PO1 1 1 1 1 1 1 1 1 1 1	e detail Outcor PO2 - - - -	ing of mes (C PO3 3 3 3 3 3	pre-fab           COs) to           PO4           3           3           3           3           3	PO5 3 3 3 3 3 3	ram C PO6 3 3 3 3 3 3	PSO1         1         1         1         1         1         1         1         1         1         1         1         1         1	PSO2 - - - -	PSO3 3 3 3 3 3 3	PSO4 3 3 3 3 3
CO3 CO4 Mapping of C Outcomes: COs CO3 CO2 CO3 CO4 Average Course Con	Desig Do th Course PO1 1 1 1 1 1 1 1 urs/Wee	e detail Outcor PO2 - - - -	ing of mes (C PO3 3 3 3 3 3	pre-fab           COs) to           PO4           3           3           3           3           3           T (Hou	PO5 3 3 3 3 3 3 3 3 3 3	ram C PO6 3 3 3 3 3 3	PSO1         1         1         1         1         1         P         (Hours/V)	PSO2 - - - -	PSO3 3 3 3 3 3 3	PSO4 3 3 3 3 3 3 Hour/Week
CO3 CO4 Mapping of C Outcomes: COs CO3 CO2 CO3 CO4 Average Course Con L (Ho	Desig Do th Course PO1 1 1 1 1 1 1 1 1 1 1	e detail Outcor PO2 - - - -	ing of mes (C PO3 3 3 3 3 3	pre-fab           COs) to           PO4           3           3           3           3           3           T (Hou	PO5 3 3 3 3 3 3	ram C PO6 3 3 3 3 3 3	PSO1         1         1         1         1         1         1         1         1         1         1         1         1         1	PSO2 - - - -	PSO3 3 3 3 3 3 3	PSO4 3 3 3 3 3 3 3
CO3 CO4 Mapping of C Outcomes: COs CO3 CO2 CO3 CO4 Average Course Con	Desig Do th Course PO1 1 1 1 1 1 1 1 urs/Wee	e detail Outcor PO2 - - - k)	ing of mes (C PO3 3 3 3 3 3 3 3 4	pre-fab         COs) to         PO4         3         3         3         3         3         3         T (Hou	PO5 3 3 3 3 3 3 3 3 3 3 3 3 3	ram C PO6 3 3 3 3 3 8 k)	PSO1 PSO1 1 1 1 1 1 1 P (Hours/V 0 Content	PSO2 - - - - - Week)	PSO3 3 3 3 3 3 Total	PSO4 3 3 3 3 3 4 Hour/Week 3
CO3 CO4 Mapping of C Outcomes: COs CO1 CO2 CO3 CO4 Average Course Con L (Ho	Desig Do th Course PO1 1 1 1 1 1 1 1 urs/Wee	e detail Outcor PO2 - - - - k) Classi	PO3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	PO4 PO4 3 3 3 T (Hou ne four	PO5 3 3 3 3 3 3 mrs/Wee 0	ram C PO6 3 3 3 3 3 3 3 4 k)	PSO1         1         1         1         1         1         1         1         1         2         Underst	PSO2	PSO3 3 3 3 3 3 3 Total explain	PSO4 3 3 3 3 3 3 4 Hour/Week 3
CO3 CO4 Mapping of C Outcomes: COs CO1 CO2 CO3 CO4 Average Course Con L (Ho	Desig Do th Course PO1 1 1 1 1 1 1 1 urs/Wee	e detail Outcor PO2 - - - - k) Classi struct	PO3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	PO4 PO4 3 3 3 3 T (Hou ie four conomy	PO5 3 3 3 3 3 3 3 3 3 3 3 3 3	PO6         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3	PSO1 PSO1 1 1 1 1 1 1 P (Hours/V 0 Content 2, Underst ication and	PSO2 Week) tand), Modu	PSO3 3 3 3 3 3 Total explain lar co-or	PSO4 3 3 3 3 3 3 Hour/Week 3 prefabricated rdination (C2,
CO3 CO4 Mapping of C Outcomes: COs CO1 CO2 CO3 CO4 Average Course Con L (Ho	Desig Do th Course PO1 1 1 1 1 1 1 1 urs/Wee	e detail Outcor PO2 - - - - k) Classi struct Under	PO3 3 3 3 3 3 3 4 5 5 6 7 7 7 7 7 7 7 7 7 7 7 7 7	PO4 PO4 3 3 3 3 T (Hou conomy o, Demo	PO5 3 3 3 3 3 3 3 3 3 3 3 3 3	ram C PO6 3 3 3 3 3 3 3 3 4 k) n (C2 refabr e and	PSO1         1         1         1         1         1         1         2, Understication and interpret the second se	PSO2 Week) tand), Modu he Struc	PSO3 3 3 3 3 3 Total explain lar co-or ctural be	PSO4 3 3 3 3 3 3 Hour/Week 3 prefabricated rdination (C2, havior of pre-
CO3 CO4 Mapping of C Outcomes: COs CO1 CO2 CO3 CO4 Average Course Con L (Ho	Desig Do th Course PO1 1 1 1 1 1 1 1 urs/Wee	e detail Outcor PO2 - - - - - k) Classi struct Under cast s	PO3 3 3 3 3 3 3 3 4 5 5 5 5 5 5 5 5 5 5 5 5 5	PO4 PO4 3 3 3 3 T (Hou ne four conomy , Demo	PO5 3 3 3 3 3 3 3 3 3 3 3 3 3	PO6 3 3 3 3 3 k) n (C2 refabr re and Iodule	PSO1         1         1         1         1         1         1         2         Understication and interpret theing of structure	PSO2 Week) tand), tand), tanduhe Struc	PSO3 3 3 3 3 3 3 Total explain lar co-or ctural bef (C3, Ag	PSO4 3 3 3 3 3 3 Hour/Week 3 prefabricated rdination (C2,
CO3 CO4 Mapping of C Outcomes: COs CO1 CO2 CO3 CO4 Average Course Con L (Ho	Desig Do th Course PO1 1 1 1 1 1 1 1 urs/Wee	e detail Outcor PO2 - - - - - k) Classi struct Under cast s consid	PO3 3 3 3 3 3 4 5 5 5 5 5 5 5 5 5 5 5 5 5	PO4 PO4 3 3 3 3 3 T (Hou be four conomy 0, Demo re and on of pr	PO5 3 3 3 3 3 3 3 3 3 3 3 3 3	ram C PO6 3 3 3 3 3 3 3 k) k) crefabr crefabr crefabr crefabr crefabr crefabr	PSO1 PSO1 1 1 1 1 1 1 1 P (Hours/V 0 Content 2, Underst ication and interpret theing of structures (0)	PSO2 Week) tand), tand), Modu he Struc uctures C6, Crea	PSO3 3 3 3 3 3 3 Total explain lar co-or ctural be (C3, Aj ate)	PSO4 3 3 3 3 3 3 Hour/Week 3 prefabricated rdination (C2, havior of pre-



3	<ul><li>floor system, slab and wall panels (C4, Analyze), Investigate two way load bearing slabs and Wall panels (C6, Create)</li><li>Discuss Dimensioning and detailing of joints for different structural</li></ul>
5	connections (C2, Understand), Differentiate Construction and expansion joints (C4, Analyze)
4	Discuss the erection of R.C. structures and equipment (C2, Understand), Organize the production, transportation, storing, shuttering and erection of structures (C4, Analyze), Investigate total prefabricated buildings (C6, Create)

Teaching - Learning Strategies	Contact Hours	
Lecture	33	
Practical		
Seminar/Journal Club		
Small group discussion (SGD)	6	
Self-directed learning (SDL) / Tutorial		
Problem Based Learning (PBL)	6	
Case/Project Based Learning (CBL)		
Revision		
Others If any:		
Total Number of Contact Hours	45	

### **Assessment Methods:**

Formative	Summative
Multiple Choice Questions (MCQ)	Mid Semester Examination 1
Viva-voce	Mid Semester Examination 2
Objective Structured Practical Examination	University Examination
Quiz	Dissertation
Seminars	Multiple Choice Questions (MCQ)
Problem Based Learning (PBL)	Short Answer Questions (SAQ)
Journal Club	Long Answer Question (LAQ)
	Practical Examination & Viva-voce
	Objective Structured Practical Examination

Nature of Assessment	CO1	CO2	CO3	CO4	
Quiz					
VIVA					
Assignment / Presentation	✓	✓	✓	✓	



Unit test		✓	✓	✓	✓		
Practical Log Bool	k/ Record Book						
Mid Semester Exa	✓	<ul> <li>✓</li> </ul>	✓	<ul> <li>✓</li> </ul>			
Mid Semester Exa	mination 2	✓	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>		
University Examin	ation	✓	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>		
		<u> </u>		I	[		
Feedback Process	5	2. Stu	ident's F	Feedback			
1. Regular feed	is taken through various s back through Mentor Mento	ntee sys					
	Text Books:         1. Hass, A. M., Precast Concrete Design and Applications, Taylor &         Francis Publishers, ISBN-13: 9780853341970.         Reference Books         1. A. S. G. Bruggeling & G. F. Huyghe, (1991), Prefabrications with						
	Concrete, CRC Press Applied Science Publish	,					Edition,



		I	Faculty	v of En	ginee	ring 8	z Technolo	gv			
Name of the	Depart		<u> </u>	Civil Engineering							
Name of the	_				<u> </u>	Ŭ		vil Engir	neering (	Structural	
					Master of Technology in Civil Engineering (Structural Engineering)						
<b>Course Code</b>				1316		<u> </u>					
Course Title						ndust	rial Struct	ures			
Academic Ye	ar			II	,	14450		4105			
Semester	<u>u1</u>			III							
Number of C	redits			3							
Course Prere		•		-	ing an	d cons	struction m	aterials			
Course Syno		·			Ŭ				develor	an in-depth	
									-	trial structure	
					-			-			
							-	-		lian Standard.	
				-					gain good		
							•		tructures like		
				bridg	e plat	e gir	ders, indu	strial s	tructures	like gantry	
				girde	rs, w	ater	tanks, suj	pport s	structures	s, high rise	
			chim	neys a	nd pre	-engineered	d thin w	alled stru	ictures.		
Course Outco	omes:				•	•	0				
At the end of		rse stud	lents w	ill be a	ble to:						
CO1		the red					stries.				
CO2			-				nd planning	[.			
CO3		the co					1 0	, 			
CO4		rstand t			-		S				
Mapping of (	Course	Outco	mes (C	COs) to	Prog	ram O	utcomes (	POs) &	Program	n Specific	
Outcomes:					C				U	-	
COs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	
C01	1	-	3	3	3	3	1	-	3	3	
<u>CO2</u>	1	-	3	3	3	3	1	-	3	3	
CO3	1	-	3	3	3	3	1	-	3	3	
CO4	1	-	3	3	3	3	1	-	3	3	
Average	1	-	3	3	3	3	1	-	3	3	
Br			L *	- <b>-</b>			<b>^</b>	1			
Course Cor	ntent•										
	urs/Wee	<b>k</b> )		T (Hou	rs/Waa	k)	P (Hours/V	Week)	Total	Hour/Week	
L (110	<u>3</u>	1X <i>)</i>			0	x)	0	(itr)	Total	<u>3</u>	
Unit	•	Conte	ent		~		v		I	~	
1				Specifi	c real	uireme	ents for in	ndustrie	s like t	extile, sugar,	
1											
					nical, etc(C1, Remember); State site layout and external Remember); Discuss Building Work, Standards for						
facilities(C1,					1. 17	scuss mm	ume v	OIK.	standards for		



	card boards, etc (C2,Understand); Understand concept of multi-storey buildings(C2,Understand); Define steel skeletal structures and Reinforced concrete frames(C1, Remember); Define Workshops, Ware houses - Single storey buildings(C1, Remember); Understand Sheds in steel and reinforced concrete and North-lights(C2,Understand); Single span spherical and other special constructions such as Cooling towers and chimneys, Bunkers and silos' prefabrication - Construction(C3, Apply);
2	Understand various construction techniques for Expansion joints, Machine foundations and Other foundations(C2, Understand); Analyze various waterproofing techniques like Roofs and roofing, Roof
	drainage(C4, Analyzed); learn about Floors and flooring joists, Curtain
	walling, Outer wall facing, Sound and shock proof mountings(C1,Remember); Use of modern hoisting and other
	construction equipments (C3,Apply).
3	Define Circulation, Communication and Transport(C1,Remember); understand Fixed points ( central cores) Staircases and Grid floor sections(C2,Understand); Analyze Lifts refuse disposals and Utilization of waste materials(C5,Evaluate) ; learn use of Cranes, Continuous conveyors, Mobile cranes, Transporters, Doors and Sliding gates(C3,Apply).
4	Investigate Functional Requirements of Lighting like Natural lighting,
4	Protection from the sun, sly lights and window cleaning installations
	Services(C6, Create); Use of Layout, wiring, fixtures, cable and pipe bridges(C3 Apply); Understand process of electrical installations and
	bridges(C3,Apply); Understand process of electrical installations and lighting substation(C2,Understand); Use of Effluent(C3, Apply).
	Explain Ventilation and fire protection functions (C2, Understand);
	Understand functions of Ventilation, Air-conditioning, Fire escapes and
	chutes, Fire alarms and Hydrants (C2,Understand).

Teaching - Learning Strategies	Contact Hours	
Lecture	28	
Practical		
Seminar/Journal Club		
Small group discussion (SGD)	06	
Self-directed learning (SDL) / Tutorial		
Problem Based Learning (PBL)		
Case/Project Based Learning (CBL)	11	
Revision		
Others If any:		



Total Number of Contact Hours

45

# **Assessment Methods:**

Formative	Summative
Multiple Choice Questions (MCQ)	Mid Semester Examination 1
Viva-voce	Mid Semester Examination 2
Objective Structured Practical Examination	University Examination
Quiz	Dissertation
Seminars	Multiple Choice Questions (MCQ)
Problem Based Learning (PBL)	Short Answer Questions (SAQ)
Journal Club	Long Answer Question (LAQ)
	Practical Examination & Viva-voce
	Objective Structured Practical Examination

Nature of Assessr	CO1	CO2	CO3	CO4				
Quiz								
VIVA								
Assignment / Pres	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓				
Unit test		✓	<ul> <li>✓</li> </ul>	✓	✓			
Practical Log Boo	k/ Record Book							
Mid Semester Exa	mination 1	✓	<ul> <li>✓</li> </ul>	✓	<ul> <li>✓</li> </ul>			
Mid Semester Exa	mination 2	✓	<ul> <li>✓</li> </ul>	✓	<ul> <li>✓</li> </ul>			
University Examir	nation	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓			
Feedback Process	ck Process 4. Stu			. Student's Feedback				
1. Regular feed	t is taken through various back through Mentor Metter through the semester through	entee syst						
References:								
	<ul> <li>Text Books</li> <li>1. El Reedy, (2010), Construction Management and Design of Industrial Concrete and Steel Structures, Taylor &amp; Francis Group, ISBN-13: 9781439815991.</li> <li>REFERENCE BOOKS</li> <li>1. Nelson G. L., (1988), Light Agricultural and Industrial Structures: Analysis and Design Kluwer Academic Publisher,</li> </ul>							



ISBN-13: 9780442267773.
2. Dr. Raja Rizwan Hussain, (2011), Pre-Cast Concrete for Multi-
Storey Structures, Create space Publisher, ISBN: 9781467918220.



		]	acult	v of En	iginee	ring	& Techno	logy		
Name of the	Depart				-	-		- 87		
	me of the Program				Civil Engineering Master of Technology in Civil Engineering (Structural					
				neering		- 61	0	0		
<b>Course Code</b>		13160329								
<b>Course Title</b>		Maintenance & Rehabilitation of Structures					res			
Academic Ye	ar			II						
Semester				III						
Number of C	redits			3						
Course Prere		<u>,</u>		Conc	rete To	echno	ology			
Course Syno	-	-					<u> </u>	will le	earn M	laintenance &
							, ,			ning different
										s and different
					ring te			. 0-		
<b>Course Outco</b>	omes:			1 I	6.0		L			
At the end of		rse stuc	lents v	vill be a	able to:	:				
CO1	Unde	rstand t	he pro	perties	of fres	sh an	d hardened	concrete	e.	
CO2			-	-			nd repairir			
CO3		n idea c	<u> </u>					0		
CO4							g materials	•		
Mapping of (			-	-	-				Progra	am Specific
Outcomes:				ŕ	U			. ,	U	-
COs	PO1	PO2	PO3	PO4	PO5	PO	5 PSO1	PSO2	PSO3	PSO4
CO1	1	-	3	3	3	3	1	-	3	3
CO2	1	-	3	-					1	2
			3	3	3	3	1	-	3	3
CO3	1	-	3	3	3	3	1 1	-	3	3
CO3 CO4	1 1	-						- - -	-	
		- - -	3	3	3	3	1	-	3	3
CO4	1		3 3	3 3	3 3	3 3	1 1	-	3 3	3 3
CO4 CO5	1 1	-	3 3 3	3 3 3	3 3 3	3 3 3	1 1 1	- - -	3 3 3	3 3 3
CO4 CO5	1 1 1	-	3 3 3	3 3 3	3 3 3	3 3 3	1 1 1	- - -	3 3 3	3 3 3
CO4 CO5 Average Course Con	1 1 1	-	3 3 3	3 3 3	3 3 3 3	3 3 3 3	1 1 1	- - -	3 3 3 3	3 3 3
CO4 CO5 Average Course Con	1 1 1	-	3 3 3	3 3 3 3 T (Hou	3 3 3 3	3 3 3 3	1 1 1 1	- - - - s/Week)	3 3 3 3	3 3 3 3
CO4 CO5 Average Course Con	1 1 1 ntent: urs/Wee	-	3 3 3	3 3 3 3 T (Hou	3 3 3 3 rs/Wee	3 3 3 3	1 1 1 1 P (Hours	- - - - s/Week)	3 3 3 3	3 3 3 3 l Hour/Week
CO4 CO5 Average Course Con L (Ho	1 1 1 ntent: urs/Wee	- - k)	3 3 3 3	3 3 3 3 T (Hou	3 3 3 3 rs/Wee 0	3 3 3 3 k)	1 1 1 1 P (Hours 0 Content	- - - - s/Week)	3 3 3 3 Tota	3 3 3 3 1 Hour/Week 3
CO4 CO5 Average Course Con L (Hon Unit	1 1 1 ntent: urs/Wee	- - k) Discu	3 3 3 3 ss Ser	3 3 3 T (Hou	3 3 3 3 rs/Wee 0	3 3 3 3 k)	1           1           1           1           P (Hours           0           Content           urability of	- - - - s/Week)	3 3 3 3 Tota	3 3 3 3 l Hour/Week
CO4 CO5 Average Course Con L (Hon Unit	1 1 1 ntent: urs/Wee	- - k) Discu Exam	3 3 3 3 ss Ser ine Q	3 3 3 3 T (Hou viceabi	3 3 3 3 s ms/Wee 0 lility ar Assura	3 3 3 3 k) nd Du nce f	1       1       1       1       P (Hours       0       Content       trability of       for concret	- - - - s/Week)	3 3 3 3 Tota res (C2, uction (	3 3 3 3 1 Hour/Week 3 Understand) -
CO4 CO5 Average Course Con L (Hon Unit	1 1 1 ntent: urs/Wee	- - k) Discu Exam Defin	3 3 3 3 ss Ser ine Que Fres	3 3 3 3 T (Hou viceability A h concrete	3 3 3 3 rs/Wee 0 llity ar Assura rete pr	3 3 3 3 k) nce f opert	1         1         1         1         P (Hours         0         Content         trability of         or concret         ies (C1, R	- - - - s/Week)	3 3 3 3 Tota res (C2, uction (0	3 3 3 3 1 Hour/Week 3 Understand) - C4, Analyze) -
CO4 CO5 Average Course Con L (Hon Unit	1 1 1 ntent: urs/Wee	- - k) Discu Exam Defin Permo	3 3 3 3 ss Ser ine Que Fres eability	3 3 3 3 T (Hou viceabi uality A h concr y - Cra	3 3 3 3 rs/Wee 0 ility ar Assura rete pro- cking	3 3 3 3 k) nd Du nce f opert (C2,	1         1         1         1         P (Hours         0         Content         trability or         for concret         ies (C1, R         Understand	- - - - s/Week) f Structur e constru emember ad) - Disc	3 3 3 3 Tota res (C2, action (0 2) – Exp cuss the	3 3 3 3 1 Hour/Week 3 Understand) - C4, Analyze) - blain Strength –



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	Corrosion mechanism (C2, Understand) - Examine the Effects of cover thickness and cracking (C4, Analyze)- Distinguish the Methods of corrosion protection (C4, Analyze) – Explain Inhibitors - Resistant steels – Coatings - Catholic protection (C2, Understand), Define Construction Scan (C1, Remember).
2	Define Chemical admixtures (C1, Remember), Describe the function of repairing materials: Patching materials, resurfacing, sealing, waterproofing, bonding materials (C2, Understand) Examine the Special types of repair materials (C4, Analyze), Explain the Selection and evaluation of repairing materials (C2, Understand) Define Expansive cement (C1, Remember)- Define Polymer concrete (C1, Remember) – Define Ferro cement (C1, Remember), Define Fiber reinforced concrete (C1, Remember) - Describe Fiber reinforced plastics
3	<ul> <li>(C2, Understand).</li> <li>Define Diagnosis and Assessment of Distress (C1, Remember) - Explain Visual inspection (C2, Understand) – Describe Non destructive tests (C2, Understand), Classify semi destructive and destructive tests (C2, Understand)</li> <li>Discuss Rust eliminators and polymers coatings for rebars during repair (C2, Understand), Explain Shotcrete - Epoxy injection (C2, Understand)</li> <li>Explain Mortar repair for cracks (C2, Understand) - Describe Shoring and underpinning (C2, Understand). Design Small crack and large crack repair (C6, Create)</li> </ul>
4	Describe the Techniques for Repair and strengthening of structures (C2, Understand), Discuss structural concrete strengthening (C2, Understand), Examine Strengthening by SIMCON (C4, Analyze), Design Retrofit using FRP composites and base isolation techniques (C6, Create)

Teaching - Learning Strategies	Contact Hours	
Lecture	33	
Practical		
Seminar/Journal Club		
Small group discussion (SGD)		
Self-directed learning (SDL) / Tutorial		
Problem Based Learning (PBL)	6	
Case/Project Based Learning (CBL)	6	
Revision		
Others If any:		
Total Number of Contact Hours	45	



Formative	Summative				
Multiple Choice Questions (MCQ)	Mid Semester Examination 1				
Viva-voce	Mid Semester Examination 2				
<b>Objective Structured Practical Examination</b>	University Examination				
Quiz	Dissertation				
Seminars	Multiple Choice Questions (MCQ)				
Problem Based Learning (PBL)	Short Answer Questions (SAQ)				
Journal Club	Long Answer Question (LAQ)				
	Practical Examination & Viva-voce				
	Objective Structured Practical Examination				

#### Mapping of Assessment with COs

Nature of Assessment	CO1	CO2	CO3	CO4	CO5
Quiz					
VIVA					
Assignment / Presentation	✓	✓	✓	✓	✓
Unit test	✓	✓	<ul> <li>✓</li> </ul>	✓	✓
Practical Log Book/ Record Book					
Mid Semester Examination 1	✓	✓	✓	✓	✓
Mid Semester Examination 2	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓
University Examination	✓	✓	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>

Feedback Process	1. Student's Feedback
recuback ribcess	1. Student STeedback

Students Feedback is taken through various steps

1.Regular feedback through Mentor Mentee system

2.Feedback between the semester through google forms

**References:** 

Text Books
1. Shetty M. S., (2008), Concrete Technology, Seventh Edition, S. Chand
& Company Ltd.ISBN-13: 9788121900034.
Reference books
1. Ravindra K. Dhir, M. Roderick Jones & Li Zheng, (2005), Repair and
Renovation of Concrete Structures, American Society of Civil Engineers,
ISBN-13: 9780727734051.
2. A. R. Santha Kumar, (2006), Concrete Technology, First Edition,
Oxford University Press, ISBN-13: 9780195671537.

Facult	of Engineering & Technology
	101



Name of the	Depart	ment		Civil	Engin	eering						
Name of the	Program Master of Technology in Ci							vil Eng	ineering (S	Structural		
	_			Engineering)								
<b>Course Code</b>	•			13160331								
<b>Course Title</b>				Design of Bridges								
Academic Ye	ear			II								
Semester				III								
Number of C	credits			3								
<b>Course Prer</b>	equisite	)		Rein	forced	Concr	ete Structu	res				
<b>Course Syno</b>	psis			Desig	gn of re	einforc	ced concret	e bridg	ges is norm	hally done on		
5	_						ctural analy					
				analy	vsis is t	o find	a distribut	ion of s	sectional f	orces which		
				fulfil	s equil	ibrium	and is sui	table fo	or design.			
<b>Course Outc</b>	omes:				-							
At the end of	the cou	rse stuc	lents w	vill be a	able to:							
CO1	Unde	Understand the load distribution and IRC standards										
CO2	Desig	n the sl	ab bric	lges								
CO3	Desig	n the A	rch br	idges								
CO4	Desig	n the b	ridge b	earing	s, hing	es and	expansion	joints				
Mapping of (	Course	Outco	mes (C	COs) to	Prog	ram O	utcomes (	POs) &	& Program	n Specific		
<b>Outcomes:</b>												
		1	1		1	1						
COs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PS	PSO3	PSO4		
CO1	1	-	3	3	3	3	1	02	3	3		
$\frac{CO1}{CO2}$	1	-	3	3	$\frac{3}{3}$	3	1	-	3	3		
$\frac{CO2}{CO3}$	1	-	<u> </u>	<u> </u>	<u> </u>	3	1	-	<u> </u>	3		
<u>CO3</u> CO4	1	-	<u> </u>	3	<u> </u>	$\frac{3}{3}$	1	-	<u> </u>	3		
	1	-	<u> </u>	<u> </u>	3 3	3	1	-	<u> </u>	3		
Average		-	3	3	3	3		-	3	3		
Course Co	ntont.											
	urs/Wee	<b>k</b> )		Т (Ноч	rs/Wee	b)	P (Hours/	Week)	Total	Hour/Week		
	ui 5/ vv ee	<b>n</b> )		T (Hours/Week)		n <i>)</i>	P (Hours/Week)		IUtal	I Utal HUUI7 WEEK		

_ (									
3		0			0	3			
Unit		Content							
1	Explain	Load Distr	ibution	Theory a	as per I.I	R.C(C2, Under	rstand);		
	Define lo	ading stand	ards for	Bridge s	labs(C1, Re	emember); Und	lerstand		
	Effective	width m	ethod a	s per I	I.R.C(C2, U	Understand);	Explain		
	Pigeaud's	Pigeaud's and Courbon's method(C2, Understand); State Assumptions							
	and analy	and analysis of a typical bridge floor as per Hendry-Jaeger method -							
	Morice – Little version of Guyon and Massonet method(C1, Remember,								
	C4, Anal			-					
2	Understa	nd and analy	yze Slab	Bridges,	Straight and	d skew slab bri	dges, T		
				0	U	ridges(C2,Unde	0		
		0				Continuous	girder		



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	bridges(C6,Create);
3	Define Arch Bridges(C1,Remember); Understand and analyze Single
	span closed and open spandrel symmetrical type (structural
	arrangements and functions only)(C2,Understand, C4,Analyzed);
	Design of bow string girder bridges(C6,Create);
4	Define various types of bridges, including box culvert, single span rigid
	frame bridges, and pre stressed composite T beam bridges(C1,
	Remember); Identify the structural components of bridges, such as slab
	base, gusset base, and grillage foundation(C1, Remember);Demonstrate
	the ability to design slab base and gusset base for different bridge
	configurations(C3, Apply); Analyze the structural integrity of various
	bridge components, including slab base, gusset base, and grillage
	foundation(C4, Analyzed)

<b>Teaching - Learning Strategies</b>	Contact Hours
Lecture	26
Practical	
Seminar/Journal Club	
Small group discussion (SGD)	
Self-directed learning (SDL) / Tutorial	10
Problem Based Learning (PBL)	5
Case/Project Based Learning (CBL)	
Revision	4
Others If any:	
Total Number of Contact Hours	45

#### **Assessment Methods:**

Formative	Summative
Multiple Choice Questions (MCQ)	Mid Semester Examination 1
Viva-voce	Mid Semester Examination 2
Objective Structured Practical Examination	University Examination
Quiz	Dissertation
Seminars	Multiple Choice Questions (MCQ)
Problem Based Learning (PBL)	Short Answer Questions (SAQ)
Journal Club	Long Answer Question (LAQ)
	Practical Examination & Viva-voce
	Objective Structured Practical Examination

Nature of Assessment	CO1	CO2	CO3	<b>CO4</b>		
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Quiz							
VIVA							
Assignment / Prese	✓	✓	<ul> <li>✓</li> </ul>	✓			
Unit test		✓	✓	<ul> <li>✓</li> </ul>	✓		
Practical Log Book	k/ Record Book						
Mid Semester Exam	mination 1	✓	✓	<ul> <li>✓</li> </ul>	✓		
Mid Semester Exam	mination 2	✓	✓	<ul> <li>✓</li> </ul>	✓		
University Examin	✓	✓	<ul> <li>✓</li> </ul>	✓			
				•			
Feedback Process	1	1. Student's Feedback					
	is taken through various s						
	k through Mentor Mentee						
	en the semester through G	oogle for	ms				
<b>References:</b>							
<ul> <li>Text Books <ol> <li>Johnson Victor, (2007), Essentials of Bridge Engineering, Sixth Edition, Oxford &amp; IBH Publishing Co. Ltd., ISBN-13: 9788120417175.</li> <li>Reference books <ol> <li>Wilbur Jay Watson, (2910), General Specifications for Concrete Bridges, Nabu Press, ISBN-13: 9781177206587.</li> <li>Portland Cement Association, (2010), Continuous Concrete Bridges, Cambridge Scholars Publishing, ISBN-13: 978115337241.</li> </ol> </li> </ol></li></ul>						75. oncrete	



Faculty of Engineering & Technology											
Name of the	Depart				Civil Engineering						
Name of the	-			Master of Technology in Civil Engineering (Structural							
	8				neering		05	U	U V		
<b>Course Code</b>				1316		,					
<b>Course Title</b>				Com	posite	Struc	tures				
Academic Ye	ar			II	•						
Semester				III							
Number of C	redits			3							
Course Prerequisite NIL											
Course Syno	psis			Stres	c Strai	n relat	ionshin o	fcomposi	ite materia	als, methods	
							-	-			
					•			ana analy	(515 01 ]	plates with	
				Lam	nated	plates.					
Course Outco			1	••••	11.						
At the end of											
CO1	2	yze composite structures									
CO2		o microscopic and macroscopic analysis									
CO3	-	halyze sandwich and laminated plates									
CO4	Under	rstand t	he fail	ure crit	eria fo	r com	posites.				
CO5		the fal									
Mapping of ( Outcomes:	Course	Outco	mes (C	COs) to	Prog	ram O	outcomes	(POs) &	Program	Specific	
COs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	
CO1	1	-	3	3	3	3	1	-	3	3	
CO2	1	-	3	3	3	3	1	-	3	3	
CO3	1	-	3	3	3	3	1	-	3	3	
CO4	1	I	3	3	3	3	1	-	3	3	
CO5	1	-	3	3	3	3	1	-	3	3	
Average	1	-	3	3	3	3	1	-	3	3	
<b>Course Con</b>	ntent:										
L (Hours/Week)			T (Hou	rs/Wee	k)	P (Hours	/Week)	Total H	lour/Week		
	3				0		0			3	
Unit		Conte									
1		Defin	e com	posite 1	nateria	ls and	its applic	ations (C	1, Remem	ber), State	
									22, Unders		
							-				
Differentiate elastic constant for anisotropic, orthotropic and isotropic materials. (C4, Analyze)											
		mater	ials. (	C4. An	alvze)						



2	Describe the concept of mesh in FEM and displacement function (C2,				
	Understand), Compare the matrix for plate elements (C4, Analyze),				
	Design and analysis of plates using FEM (C6, Create), Drive Stress-				
	Strain Matrix – Stiffness matrix of plate element (C6, Create)				
3	Classify the mechanics of materials approach (C2, Understand),				
	Compare Micro mechanics, Mechanics of materials approach, elasticity				
	approach to determine material properties, Macro Mechanics (C4,				
	Analyze), Interpret the Stress-strain relations with respect to natural				
	axis, arbitrary axis (C3, Apply), Examine the material properties and				
	Experimental characterization of lamina (C4, Analyze)				
4	Discuss failure criteria for composites (C2, Understand), Differentiate				
	the Governing differential equation for a general laminate, angle ply and				
	cross ply laminates (C4, Analyze), Formulate and derive differential				
	equation for laminated plates (C6, Create)				

Teaching - Learning Strategies	Contact Hours
Lecture	28
Practical	
Seminar/Journal Club	
Small group discussion (SGD)	
Self-directed learning (SDL) / Tutorial	8
Problem Based Learning (PBL)	
Case/Project Based Learning (CBL)	5
Revision	4
Others If any:	
Total Number of Contact Hours	45

#### **Assessment Methods:**

Formative	Summative
Multiple Choice Questions (MCQ)	Mid Semester Examination 1
Viva-voce	Mid Semester Examination 2
<b>Objective Structured Practical Examination</b>	University Examination
Quiz	Dissertation
Seminars	Multiple Choice Questions (MCQ)
Problem Based Learning (PBL)	Short Answer Questions (SAQ)
Journal Club	Long Answer Question (LAQ)
	Practical Examination & Viva-voce
	Objective Structured Practical Examination

Nature of Assessment	CO1	CO2	CO3	<b>CO4</b>	CO5	



Quiz							
VIVA							
Assignment / Presentation			✓	✓	✓	<ul> <li>✓</li> </ul>	
Unit test		<ul> <li>✓</li> </ul>	✓	✓	✓	<ul> <li>✓</li> </ul>	
Practical Log Boo	ok/ Record Book						
Mid Semester Exa	amination 1	<ul> <li>✓</li> </ul>	✓	✓	✓	<ul> <li>✓</li> </ul>	
Mid Semester Examination 2			✓	✓	✓	<ul> <li>✓</li> </ul>	
University Examination			✓	<ul> <li>✓</li> </ul>	✓	<ul> <li>✓</li> </ul>	
1.Regular feedbac	k is taken through various k through Mentor Mente een the semester through g	s steps e system		t's Feedt			
	Text Books1. Madhujit Mukhopaand Structures, First9788173714771.Reference books1. Jones, R.M., (199Edition, Taylor and Fra2. Atul K. Kaw, (20)Edition, CRC Press, IS	Edition 98), Me ancis Pu 05), M	chanics blisher, Is echanics	Blacksw of Comp sbn-13: 9 of Com	van Pvt. posite M 97815603	Ltd., I Iaterials, 327127.	SBN-13: Second



Faculty of Engineering & Technology					
Name of the Department	Civil Engineering				
Name of the Program	Master of Technology in Civil Engineering (Structural				
	Engineering)				
Course Code	13160335				
Course Title	Design of Tall Buildings				
Academic Year	II				
Semester	III				
Number of Credits	3				
<b>Course Prerequisite</b>	Structural Analysis				
Course Synopsis	Classification of buildings, Three dimensional analysis,				
	Shear wall system, In-filled frame system, Plane frame				
	system.				
Course Outcomes					

**Course Outcomes:** 

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

**CO1** Know the types of tall buildings.

**CO2** Analyze the plane frame systems by different methods.

CO3 Design the shear wall systems and in filled frame systems.

Mapping of Course Outcomes (COs) to Program Outcomes (POs) & Program Specific Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	1	-	3	3	3	3	1	-	3	3
CO2	1	-	3	3	3	3	1	-	3	3
CO3	1	-	3	3	3	3	1	-	3	3
Average	1	-	3	3	3	3	1	-	3	3

#### **Course Content:**

L (Hours/Wee	ek)	T (Hours/Week)	P (Hours/Week)	Total Hour/Week				
3		0	0	3				
Unit		Content						
1	Describe	the importance of	tall buildings (C2, U	Understand) - Classify				
	the build	the buildings according to NBC (C2, Understand) – Explain the types of						
	load wind	load wind load, Seismic load, Quasi static approach (C2, Understand).						
2	Discuss the plane frame system (C2, Understand)- Describe the method							
	of Calculation of wind load (C2, Understand) – Explain approximate							
	method (C2, Understand) – Appraise the significance of cantilever and							
	factor methods (C5, Evaluate) - Explain Kani's method (C2,							
	Understand) - Discuss the substitute frame method for dead load and							
	live loads	s (C2, Understand).						
3	Explain	Shear Wall System	n (C2, Understand)	, Describe Rosman's				



	analysis, Design aspect, RC frame and shear wall interaction – Equivalent frame method (C2, Understand), Compare the different methods of analysis (C4, Analyze), Design of shear wall system (C6, Create)
4	Discuss In-filled Frame Systems: Importance – Methods of analysis (C2, Understand), Compare Equivalent truss and frame method, Force- displacement method (C4, Analyze), Design and analysis of in filled frame system (C6, Create)

Teaching - Learning Strategies	Contact Hours	
Lecture	32	
Practical		
Seminar/Journal Club		
Small group discussion (SGD)		
Self-directed learning (SDL) / Tutorial	8	
Problem Based Learning (PBL)		
Case/Project Based Learning (CBL)	5	
Revision		
Others If any:		
Total Number of Contact Hours	45	

#### **Assessment Methods:**

Formative	Summative
Multiple Choice Questions (MCQ)	Mid Semester Examination 1
Viva-voce	Mid Semester Examination 2
Objective Structured Practical Examination	University Examination
Quiz	Dissertation
Seminars	Multiple Choice Questions (MCQ)
Problem Based Learning (PBL)	Short Answer Questions (SAQ)
Journal Club	Long Answer Question (LAQ)
	Practical Examination & Viva-voce
	Objective Structured Practical Examination

Nature of Assessment	CO1	CO2	CO3		
Quiz					
VIVA					
Assignment / Presentation	✓	✓	✓		
Unit test	✓	✓	✓		



Practical Log Boo	k/ Record Book							
Mid Semester Examination 1			✓	✓				
Mid Semester Exa	mination 2	✓	<ul> <li>✓</li> </ul>	✓				
University Examin	nation	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓				
		1		<u>    I                                </u>	<u> </u>			
Feedback Proces	<u>s</u>	1. Student's Feedback						
Students Feedback	k is taken through various	steps						
	k through Mentor Mentee	-	l					
2.Feedback betwee	en the semester through g	oogle fo	orms					
<b>References:</b>								
	Text Books							
	1. Bryan Stafford Smith and Alex Coull, (2011), Tall Building Structures:							
	Analysis and Design, Wiley India, ISBN-13: 9788126529896.							
	Reference books							
	1. Sarwar Alam Raz, (2	2002),	Structural	Design	in Steel,	Second	Edition,	
	New Age International,	ISBN-	13: 97881	2243228	32.			



### Master of Technology in Civil Engineering (Remote Sensing and GIS) 3<sup>rd</sup> Semester



		]	Facult	y of En	igineei	ring &	Technolo	gy		
Name of the l	Depart				Engin					
Name of the l	Progra	m		Mast	Master of Technology in Civil Engineering (Remote					
				Sensing and GIS)						
Course Code					0370					
Course Title					al Imag	ge Proc	cessing			
Academic Year				II		_				
Semester										
Number of C	redits			4						
<b>Course Prere</b>	quisite	;		Imag	e Proc	essing				
Course Syno	psis			Digit	al imag	ge proc	essing inc	ludes I	ntroductio	on Image
				proce	essing s	system	Image Ai	nalysis	and Unde	erstanding
				and M	Aulti te	empora	l Data mei	ging –	Change d	letection
				-		• •	er-spectral	Image	Analysis	and Radar
				imag	e analy	vsis.				
Course Outco	omes:									
At the end of										
CO1									•	Engineering
CO2	Stude	nts will	under	stand a	bout G	IS and i	image proc	essing	technique	es
CO3	-	and and			/ 1	0				
CO4	-		<u> </u>			-		~ ~		ge analysis
Mapping of C	Course	Outco	mes (C	COs) to	Prog	ram O	utcomes (1	POs) &	2 Program	n Specific
Outcomes:										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PS	PSO3	PSO4
COS	101	102	105	104	105	100	1501	02	1505	1504
001								-		
CO1	1	-	3	3	3	3	1	-	3	3
CO2	1 1	-	3	3	3	3	1	-	3	3
CO2 CO3		-	3 3	3 3	3 3	3 3	1 1	-	3 3	3 3
CO2	1	- - -	3 3 3	3 3 3	3 3 3	3 3 3	1	-	3 3 3	3 3 3
CO2 CO3	1 1	-	3 3	3 3	3 3	3 3	1 1	-	3 3	3 3
CO2 CO3 CO4	1 1 1	-	3 3 3	3 3 3	3 3 3	3 3 3	1 1 1	-	3 3 3	3 3 3
CO2 CO3 CO4	1 1 1	-	3 3 3	3 3 3	3 3 3	3 3 3	1 1 1	-	3 3 3	3 3 3
CO2 CO3 CO4 Average Course Con	1 1 1	-	3 3 3 3	3 3 3	3 3 3 3	3 3 3 3	1 1 1	- - - -	3 3 3 3	3 3 3
CO2 CO3 CO4 Average Course Con	1 1 1 1	-	3 3 3 3	3 3 3 3 T (Hou	3 3 3 3	3 3 3 3	1 1 1 1	- - - -	3 3 3 3	3 3 3 3
CO2 CO3 CO4 Average Course Con	1111ntent:urs/Wee	-	3 3 3 3	3 3 3 3 T (Hou	3 3 3 3 rs/Weel	3 3 3 8 k)	1 1 1 1 P (Hours/V	- - - -	3 3 3 3	3 3 3 3 Hour/Week
CO2 CO3 CO4 Average Course Con L (Hou	1111ntent:urs/Wee	- - - k)	3 3 3 3	3 3 3 T (Hou	3 3 3 3 rs/Weel 1	3 3 3 k)	1 1 1 1 P (Hours/V 0 Content	- - - - Week)	3 3 3 3 Total	3 3 3 3 Hour/Week
CO2 CO3 CO4 Average Course Con L (Hou Unit	1111ntent:urs/Wee	- - k) Image retriev	3 3 3 3 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	3 3 3 T (Hou	3 3 3 syste Forma	3 3 3 k) m; Sa ts – (	1       1       1       1       P (Hours/V)       0       Content       tellite     dat       Compressi	- - - - - Week)	3 3 3 3 Total uisition - Satellite	3 3 3 3 Hour/Week 4 -Storage and System (C1,
CO2 CO3 CO4 Average Course Con L (Hou Unit	1111ntent:urs/Wee	- - k) Image retriev Reme	3 3 3 3 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	3 3 3 T (Hou cessing Data Data	3 3 3 syste Forma produce	3 3 3 k) m; Sa ts – ( cts – Ii	1       1       1       1       P (Hours/V)       0       Content       tellite     dat       Compressi       nage     displ	- - - Week) (a acquon - ay system)	3 3 3 Total uisition - Satellite tem - Cu	3 3 3 Hour/Week 4 -Storage and System (C1, urrent Remote
CO2 CO3 CO4 Average Course Con L (Hot Unit	1111ntent:urs/Wee	- - k) Image retriev Reme	3 3 3 3 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	3 3 3 T (Hou cessing Data Data	3 3 3 syste Forma produce	3 3 3 k) m; Sa ts – ( cts – Ii	1       1       1       1       P (Hours/V)       0       Content       tellite     dat       Compressi       nage     displ	- - - Week) (a acquon - ay system)	3 3 3 Total uisition - Satellite tem - Cu	3 3 3 3 Hour/Week 4 -Storage and System (C1,
CO2 CO3 CO4 Average Course Con L (Hot Unit	1111ntent:urs/Wee	- - k) Image retriev Reme Sensin	3 3 3 3 2 2 2 2 3 3 3 3 3 3 3 3 3 3 3 3	3       3       3       3       T (Hou       cessing       Data       ystems.	3 3 3 3 rs/Weel 1 syste Forma produce Prep	3 3 3 k) m; Sa ts – 0 cts – In processi	1       1       1       P (Hours/V)       0       Content       tellite     dat       Compressinate       inage     display       inage     display	- - - - Week) Ca acqu on – ay systemotely	3 3 3 3 Total uisition - Satellite tem - Cu y sensed	3 3 3 Hour/Week 4 -Storage and System (C1, urrent Remote
CO2 CO3 CO4 Average Course Con L (Hou Unit	1111ntent:urs/Wee	- - k) Image retriev Reme Sensin Under	3 3 3 3 2 3 2 2 2 3 3 2 3 2 3 3 2 3 2 3	3 3 3 3 T (Hou cessing Data ; Data ; Radi	3 3 3 3 rs/Weel 1 syste Forma produc Prep ometric	3 3 3 3 k) m; Sa ts – 0 cts – In processi c and	1         1         1         1         P (Hours/V)         0         Content         tellite dat         Compressi         nage displ         ing of re         Geometric	- - - - - Week) Ca acquo on – ay systemotely c distor	3 3 3 3 Total uisition - Satellite tem - Cu y sensed ttions and	3 3 3 3 Hour/Week 4 -Storage and System (C1, urrent Remote data; (C2,
CO2 CO3 CO4 Average Course Con L (Hot Unit	1111ntent:urs/Wee	- - k) Image retriev Reme Sensin Under Geom Ration	3 3 3 3 e proc val – mber) ng Sy rstand) netric c ning	3 3 3 3 T (Hou cessing Data Data S Data vstems. ; Radi correcti –Princ	3 3 3 3 rs/Weel 1 syste Forma produce Prep ometric on Race	3 3 3 k) m; Sa ts – ( cts – In processi c and liometri and	1         1         1         1         P (Hours/V)         0         Content         tellite dat         Compressionage displang of region         ing of region         Geometric         ric correct	- - - - - - - - - - - - - - - - - - -	3 3 3 Total uisition - Satellite tem - Cu y sensed tions and loise rem	3 3 3 3 Hour/Week 4 -Storage and System (C1, urrent Remote data; (C2, l corrections-



2	Image Rectification and Restoration. Image enhancement- Contrast Manipulation – Gray-Level (C2, Understand, C4, Analyzed); Thresh holding- Level Slicing Contrast Stretching. Convolution – Edge Enhancement – Spatial feature manipulation. Image transformations; Pattern recognition, Image classification, Image fusion and change detection. Pattern recognition – Shape analysis- Textural and contextual
	analysis. (C6,Create);
3	Multi temporal Data merging – Change detection procedures- Multi sensor image merging – Merging of image data with Ancillary data
	Incorporating GIS Data in automated land cover classification.
	(C2,Understand, C4,Analyzed), (C6,Create);
4	Atmospheric correction – Hyper-spectral image analysis techniques.(C1,
	Remember), (C4, Analyzed)

Teaching - Learning Strategies	Contact Hours
Lecture	30
Practical	
Seminar/Journal Club	
Small group discussion (SGD)	
Self-directed learning (SDL) / Tutorial	21
Problem Based Learning (PBL)	5
Case/Project Based Learning (CBL)	
Revision	4
Others If any:	
Total Number of Contact Hours	60

#### **Assessment Methods:**

Formative	Summative
Multiple Choice Questions (MCQ)	Mid Semester Examination 1
Viva-voce	Mid Semester Examination 2
Objective Structured Practical Examination	University Examination
Quiz	Dissertation
Seminars	Multiple Choice Questions (MCQ)
Problem Based Learning (PBL)	Short Answer Questions (SAQ)
Journal Club	Long Answer Question (LAQ)
	Practical Examination & Viva-voce
	Objective Structured Practical Examination

Nature of Assessment	CO1	CO2	CO3	<b>CO4</b>		
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Quiz									
VIVA									
Assignment / Pres	sentation	✓	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>				
Unit test		✓	✓	✓	<ul> <li>✓</li> </ul>				
Practical Log Boo	ok/ Record Book								
Mid Semester Exa	amination 1	✓	✓	✓	✓				
Mid Semester Exa	amination 2	✓	✓	✓	✓				
University Exami	nation	✓	✓	✓	<ul> <li>✓</li> </ul>				
Feedback Proces	S	1. Student's Feedback							
Students Feedbac	k is taken through variou	us steps							
	k through Mentor Ment		1						
2.Feedback betwee	en the semester through	google f	orms						
<b>References:</b>									
	Text Books:         1. John R Jenson "Introducing Digital Image Processing" Prantice Hall.         New Jersy 1986.         2. R. A. Schowengergt, "Techniques for Image Processing and Classification in Remote Sensing'; 1983         Reference Books:         1. Remote Sensing & Image Interpretation Thomas M. Lillesand, Ralph W.Kiefer,         2. Image Interpretation in Geology Drury S.A.         3. Robert A Schowengergt, "Remote Sensing – Models and Methods for Image Processing¬ Academic Press 1997 Hord R M, Academic Press, 1982.								



## Master of Technology in Civil Engineering (Remote Sensing and GIS)

# Departmental Electives



		]	Facult	v of En	gineer	ring &	& T	echnolo	gv		
Name of the	Depart				Engin				01		
Name of the	_				0	· · · ·		v in Civ	il Eng	ineering (]	Remote
					Master of Technology in Civil Engineering (Remote Sensing and GIS)						
<b>Course Code</b>				1316	0		/				
Course Title					and M	obile	GIS	5			
Academic Ye	ar			II				-			
Semester	Semester III										
Number of Credits 3											
<b>Course Prere</b>	quisite			GIS							
Course Syno				Web	GIS, it	s fun	ctio	n, web r	nappin	g, mobile	GIS
Course Outco	-			1	,				- 11	<u> </u>	
At the end of	the cou	rse stuc	lents v	vill be a	ble to:						
CO1	Publis	sh geos	patial	data in	web er	nviror	nme	nt.			
CO2	Analy	ze the	geospa	atial lay	ers in	web e	envi	ronment			
CO3	Prepa	re and j	publisl	n geosp	atial d	ata in	mo	bile app	licatio	ns	
CO4	Devel	op app	licatio	ns in w	eb and	mob	ile p	latform	S		
Mapping of (	Course	Outcor	mes (C	COs) to	Prog	am (	Duto	comes (l	POs) &	& Program	n Specific
<b>Outcomes:</b>											
COs	PO1	PO2	PO3	PO4	PO5	PO	6	PSO1	PS 02	PSO3	PSO4
CO1	1	-	3	3	3	3		1	-	3	3
CO2	1	-	3	3	3	3		1	-	3	3
CO3	1	-	3	3	3	3		1	-	3	3
CO4	1	-	3	3	3	3		1	-	3	3
Average	1	-	3	3	3	3		1	-	3	3
<b>Course Con</b>	ntent:										
L (Ho	urs/Wee	<b>k</b> )		T (Hou	rs/Wee	k)	Р	(Hours/V	Veek)	Total	Hour/Week
	3				0			0			3
Unit							Co	ontent			
1				-				•			omponents of
											GIS, users and
								-			of web GIS,
				of We	b GIS	S.(C2	, l	Jndersta	nd);	(C1, Rer	nember, C4,
		Analy						** 7 1		•	
2						_		-	-		pen GIS web
		map						-		ge - pr	-
								napping	progra	ains. (C2,	Understand);
3				ber, C				nformat	on fai	the mult	ia dicalari af
3			-	-	•	-				-	ic, display of ation, sharing
											f spatial data,
		and d	190100		spatia	i uala	a a8	wen as	mana	gement 0	i spanai uata,



	Style Layer Description (SLD), Open layers, Geo-server applications. (C2,Understand, C4,Analyzed), (C6, Create);					
4	Location based services, Case studies on Mobile Solutions; Mobile App Development Approaches, HTML5 Geolocation; Creating a Mobile App, jQuery Mobile - Components, Event Handling, Mobile Configuration Third-party APIs; Google Maps API; ArcGIS API; Leaflet API, Mobile App development in Android, IOS platforms (C4, Analyzed)					

Teaching - Learning Strategies	Contact Hours	
Lecture	26	
Practical		
Seminar/Journal Club		
Small group discussion (SGD)		
Self-directed learning (SDL) / Tutorial	10	
Problem Based Learning (PBL)	5	
Case/Project Based Learning (CBL)		
Revision	4	
Others If any:		
Total Number of Contact Hours	45	

#### **Assessment Methods:**

Formative	Summative
Multiple Choice Questions (MCQ)	Mid Semester Examination 1
Viva-voce	Mid Semester Examination 2
Objective Structured Practical Examination	University Examination
Quiz	Dissertation
Seminars	Multiple Choice Questions (MCQ)
Problem Based Learning (PBL)	Short Answer Questions (SAQ)
Journal Club	Long Answer Question (LAQ)
	Practical Examination & Viva-voce
	Objective Structured Practical Examination

Nature of Assessment	CO1	CO2	CO3	CO4	
Quiz					
VIVA					
Assignment / Presentation	1	1	✓	✓	
Unit test	✓	✓	~	✓	



Practical Log Bool	k/ Record Book							
Mid Semester Exa	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>				
Mid Semester Exa	mination 2	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓			
University Examin	nation	<ul> <li>✓</li> </ul>	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>			
Feedback Process	8	1.	Studen	t's Feedb	back			
	t is taken through various							
	k through Mentor Mentee							
	en the semester through G	ioogle t	orms					
References:								
	<b>TEXTBOOKS:</b>							
	• A. Web Cartograp	hy: Dev	elopment a	and Prosp	ects, Kraa	ak, M. and		
	Brown, Taylor and	l Francis	s, London,	2001.				
	• Web GIS Applicat A.,VDMVerlag,20		ocal Gove	rnment, T	Tereshenk	ov,		
	• GIS for Web Devel		Adding wh	ere to you	ır web apı	olications,		
	Davis, S, First Edition, The Pragmatic Programmers LLC,2007.							
	<b>REFERENCE BOOK</b>	S:						
	<ul> <li>Web GIS: Principles and Applications, Pinde Fuand Jiulin Sun, ESRI Press, 2011</li> </ul>							
	<ul> <li>Mobile:UpandRunning,MaximilianoFirtman.,jQuery,O'Reilly,2012</li> <li>Dynamic and Mobile GIS, Drummond, J., &amp; Group, F., First Edition, CRC Press Taylor and Francis Group,2007.</li> </ul>							



		I	Faculty	y of Er	igineer	ing &	: Technolo	gy		
Name of the	Depart	ment		Civil	Engine	eering				
Name of the Program				Mast	Master of Technology in Civil Engineering (Remote					
				Sensi	ing and	GIS)				
<b>Course Code</b>				1316	0372					
<b>Course Title</b>				Argo	Remo	te Sen	sing			
Academic Ye	ar			II						
Semester				III						
Number of C	redits			3						
<b>Course Prere</b>	equisite	•		Rem	ote Sen	sing				
Course Syno	psis			Satel	lite sen	isors, A	Agro-Mete	orolog	ical Appli	cations of
	-						-	-		ctral Remote
				Sensi	ing, cro	op info	ormatics, C	rop co	ndition and	d cropping
				syste	m anal	ysis us	sing differe	nt sen	sors	
<b>Course Outc</b>	omes:									
At the end of	the cou	rse stuc	lents w	vill be a	able to:					
CO1	Acqui	re state	of art s	ensor d	ata to re	etrieve	crop parame	eters.		
CO2	Analy	ze the b	asic veg	getatior	n param	eter an	d their inter	action	with differe	ent parts of the
		omagne								
CO3					a to stu	dy the	crop conditi	ons du	ring variou	s stages of
GOA		ltural pr			1.	1.0	1	. 1 1	<u> </u>	. 1, 1
CO4	Apply produce		nt senso	ors to pi	redict ai	nd fore	cast the var	ables a	iffecting the	e agricultural
Mapping of Outcomes:	Course	Outco	mes (C	COs) to	Progr	ram O	utcomes (]	POs) &	& Program	n Specific
COs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PS O2	PSO3	PSO4
CO1	1	-	3	3	3	3	1	-	3	3
CO2	1	-	3	3	3	3	1	-	3	3
CO3	1	-	3	3	3	3	1	-	3	3
CO4	1	I	3	3	3	3	1	-	3	3
Average	1	•	3	3	3	3	1	-	3	3
Course Co	ntent:									
	urs/Wee	k)		T (Hou	rs/Weel	k)	P (Hours/V	Veek)	Total	Hour/Week
	3	/			0		0			3
Unit	-						Content			_
1		Satell	ite ser	nsors a	and the	eir cha	aracteristics	s, Prin	ciples, in	strumentation
									-	ET, Remote
		-				-	-	-	-	various crop
			-				-			transpiration.
	(C2, Understand); (C1, Remember, C4, Analyzed)									
2		Surfac	ce and	vado	se zon	e soil	moisture	estima	ation usin	g microwave



	optical and hyper spectral remote sensing techniques; Soil mapping large-scale high spatial resolution mapping of soil texture information; Assessment, Prediction and Monitoring of Droughts through satellite retrieved causal variable information; Flood mapping and monitoring; Water resources mapping; Real-time weather monitoring (C2, Understand); (C1, Remember, C4, Analyzed)
3	Crop classification and crop area estimation using digital analysis; Crop stress assessment using satellite data; Crop parameter retrieval, cropping pattern & cropping indices analysis, Crop yield modeling and estimation. Crop water requirements, Irrigation water requirements (C2, Understand); (C1, Remember, C4, Analyzed)
4	ICT application in agriculture at village/block scale, Demonstration on DSS in agriculture; Precision farming (C2, Understand); (C1, Remember, C4, Analyzed)

Teaching - Learning Strategies	Contact Hours
Lecture	26
Practical	
Seminar/Journal Club	
Small group discussion (SGD)	
Self-directed learning (SDL) / Tutorial	10
Problem Based Learning (PBL)	5
Case/Project Based Learning (CBL)	
Revision	4
Others If any:	
Total Number of Contact Hours	45

#### **Assessment Methods:**

Formative	Summative
Multiple Choice Questions (MCQ)	Mid Semester Examination 1
Viva-voce	Mid Semester Examination 2
<b>Objective Structured Practical Examination</b>	University Examination
Quiz	Dissertation
Seminars	Multiple Choice Questions (MCQ)
Problem Based Learning (PBL)	Short Answer Questions (SAQ)
Journal Club	Long Answer Question (LAQ)
	Practical Examination & Viva-voce
	Objective Structured Practical Examination

Nature of Assessment	CO1	CO2	CO3	CO4		
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Quiz								
VIVA								
Assignment	/ Presentation	✓	✓	✓	✓			
Unit test		✓	✓	✓	✓			
Practical Lo	g Book/ Record							
Book								
Mid Semeste	er Examination 1	✓	✓	✓	<ul> <li>✓</li> </ul>			
Mid Semeste	er Examination 2	✓	✓	✓	✓			
University E	Examination	✓	✓	✓	✓			
				I	1			
Feedback P	rocess	2. Stud	ent's Feedbac	ck				
1.Regular fe	Feedback is taken through various steps feedback through Mentor Mentee system ck between the semester through google forms							
]	TEXTBOOKS:							
	<ul> <li>TEXTBOOKS:         <ul> <li>Applicationsofremotesensinginagriculture.,M.D.Steven,J.A.Clark,Butterwort hpublisher,London,1990</li> <li>Manual of Remote Sensing, Ustin, S, Remote Sensing for Natural Resource Management and Environmental Monitoring, 3<sup>rd</sup> Edition,Volume4,Willey Publishing.2001</li> <li>Agro meteorology and sustainable agriculture. M. V. K. Sivakumar, R. Gommes, W.BaierAgriculturalandForestMeteorology103(2000)11–26</li> <li>Application radar in Agriculture, Holmes M.G., Remote sensing applications to agriculture, Butter worth publisher, London, 1990.</li> </ul> </li> <li>REFERENCE BOOKS:         <ul> <li>Introduction to Agro meteorology (1994), Second edition by H.S. Mavi, Oxford &amp; IBH Publishing Co. Pvt. Ltd.</li> </ul> </li> </ul>							



Faculty of Engineering & Technology						
Name of the Department	Civil Engineering					
Name of the Program	Master of Technology in Civil Engineering (Remote					
_	Sensing and GIS)					
Course Code	13160373					
Course Title	Remote Sensing Geology					
Academic Year	II					
Semester	III					
Number of Credits	3					
Course Prerequisite	Remote Sensing					
Course Synopsis	Radiation, concept of remote sensing, platforms,					
	spacecraft, sensors, data acquisition and processing,					
	Hydrogeology, Subsurface exploration techniques					

**Course Outcomes:** 

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

CO1 Interpret the satellite imageries for geological features.

**CO2** Identify and analyze geological structures from satellite images.

**CO3** Apply geophysical principles for subsurface exploration.

CO4 Identifygroundwaterpotentialzones,landslidehazardzonesandmineral resources

Mapping of Course Outcomes (COs) to Program Outcomes (POs) & Program Specific Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PS O2	PSO3	PSO4
CO1	1	-	3	3	3	3	1	-	3	3
CO2	1	-	3	3	3	3	1	-	3	3
CO3	1	-	3	3	3	3	1	-	3	3
CO4	1	-	3	3	3	3	1	-	3	3
Average	1	-	3	3	3	3	1	-	3	3

#### **Course Content:**

L (Hours/Wee	<b>k</b> )	T (Hours/Week)	P (Hours/Week)	Total Hour/Week				
3		3						
Unit			Content					
1				ectromagnetic Radiation-				
		Reflectance, Transmission, Absorption, Thermal Emissions, Interaction with						
	Atmosphere, Atmospheric windows, Spectral reflectance of Earth's surface							
	features, and Multi concept of Remote Sensing. (C2, Understand); (C1,							
	Remembe	r, C4, Analyzed)	-					
2	Various ty	pes of platforms, diff	erent types of aircraft	, manned and unmanned				
	spacecraft	s used for da	ata acquisition -	- characteristics of				
	differentty	differenttypesofplatforms-						
	airborneai	airborneandspaceborne, IRSS at elliteSensors, LANDS AT, SPOT, IKONOS,						
	Quickbird	, Geoeye, Kompsat, V	Vorldview II & III, M	icrowave, ALOS, Planet				
	Data, Sen	tinel, SMAP, MODIS	etc. (C2, Understand	d); (C1, Remember, C4,				



	Analyzed)
3	Optical, Thermal and Microwave; Resolutions-spatial, spectral, radiometric
	and temporal, signal to noise ratio, LiDAR data acquisition and processing.
	(C2, Understand); (C1, Remember, C4, Analyzed)
4	Subsurface exploration techniques, geophysical investigations - electrical
	resistivity and seismic methods. Hydrogeology - principles of groundwater and
	ground water geology Ground water flow, surface and ground water
	interaction; controls of ground water occurrence and movement Ground water
	geology: Hydro geological properties of different rocks, structures and land
	form sand their detection from remotely sensed data, Ground water targeting
	and resource assessment Ground water targeting in different geologic terrains,
	rain water harvesting, artificial ground water recharge. (C2, Understand); (C1,
	Remember, C4, Analyzed)

Teaching - Learning Strategies	Contact Hours	
Lecture	26	
Practical		
Seminar/Journal Club		
Small group discussion (SGD)		
Self-directed learning (SDL) / Tutorial	10	
Problem Based Learning (PBL)	5	
Case/Project Based Learning (CBL)		
Revision	4	
Others If any:		
Total Number of Contact Hours	45	

#### **Assessment Methods:**

Formative	Summative
Multiple Choice Questions (MCQ)	Mid Semester Examination 1
Viva-voce	Mid Semester Examination 2
Objective Structured Practical Examination	University Examination
Quiz	Dissertation
Seminars	Multiple Choice Questions (MCQ)
Problem Based Learning (PBL)	Short Answer Questions (SAQ)
Journal Club	Long Answer Question (LAQ)
	Practical Examination & Viva-voce
	Objective Structured Practical Examination

Nature of Assessment	CO1	CO2	CO3	CO4	
Quiz					





VIVA					
Assignment / Presentation	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓	✓	
Unit test	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓	✓	
Practical Log Book/ Record					
Book					
Mid Semester Examination 1	<ul> <li>✓</li> </ul>	✓	✓	✓	
Mid Semester Examination 2	✓	✓	✓	✓	
University Examination	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓	✓	
	I		I	L	<u> </u>
Feedback Process	3. St	udent's Fee	dback		
2. Remote sensin and Compar 3. TextBookofEr 2018 <b>REFERENCE BO</b> 4. Principles of 0 2018. 5. Image Interpre 6. Remote Sensi	ng Geology, ng Geology, ng: Principle ny,2020. ngineeringG <b>DOKS:</b> Geomorphole etation in Ge ng and Imag ipman, Wile of Remote S	e system Google form Ravi P. Gup s and Interpresent eology, N.Ch ogy, Thornbo eology, Drua e Interpretat ey Publishers Sensing, Geo	ota, Springer retation, Floy eennaKesavul ury, W.D., N ry, S.A., Alle ion, Thomas 5,2015	Verlag Publicatio d F. Sabins.,W.F lu.,MacMillanLto ew Age Internati en and Unwin Lto Lilles and, Ralpl C	I. Freeman d.,NewDelhi. onal Publishers, d, 2004.



		1	Fooult	ofFr	ainoo	ing	& Tech	nolo	av				
Nome of th	o Donout		racuity		0			1010	gy				
Name of the	-			Civil Engineering Master of Technology in Civil Engineering (Remote									
Name of the	e Progra								II Elig	meering (	Kemote		
Course Cod	1			1316	$\frac{1}{0274}$	1015	)						
						inatio	n Catall	:4 . (	1				
Course Titl		al Nav	igatic	n Satell	ite s	system	1						
Academic Y	ear			II									
Semester	~			III									
Number of				3									
<b>Course Pre</b>	-	9					mage P		-				
Course Syn	opsis						system, tellite Oi				rdinate system		
Course Out	tcomes:												
At the end o	of the cou	rse stuc	lents w	vill be a	able to:								
CO1	Identi	entify GNSS components and their functions											
CO2	Select	GNSS	survey	method									
CO3	Interp	ret navi	gation r	nessage	e and G	NSS s	atellite s	signa	ls				
CO4			0	Ų			ns in GN	<u> </u>		ations			
COs	PO1	PO2	PO3	PO4	PO5	РО	6 PS	01	PS O2	PSO3	PSO4		
CO1	1	-	3	3	3	3	1	L	-	3	3		
CO2	1	-	3	3	3	3	1	L	-	3	3		
CO3	1	-	3	3	3	3	1	L	-	3	3		
CO4	1	-	3	3	3	3	1	L	-	3	3		
Average	1	-	3	3	3	3	1	L	-	3	3		
0	•				•		•						
Course Co	ontent:												
	Iours/Wee	k)		T (Hours/Week)			P (Hours/Week)			Total	Total Hour/Week		
	3	/		,	0	/	_ (	0			3		
Uni					~		Conte	-		1	-		
1		Histo	rv of (	<b>GNSS</b> :	GPS	syste			es and	Segment	s, GLONASS		
1			•			•				0			
		system- Services and Segments, Galileo System- Services and Segments, Regional Navigation Satellite Systems (RNSS),											
		Augmentation Systems, GAGAN, IRNSS systems.(C2, Understand); (C1,											
		Remember, C4, Analyzed)											
2		1				leode	sv. Eart	h. G	eoid a	nd Ellipso	id of rotation		
-				-	-		•			-			
				rfaces and coordinate systems in Geodesy, Indian Geodetic Everest Spheroid, WGS 84, Geodetic coordinate systems,									



	Structure of Signal, Navigation messages. Pseudo range measurements, Atmospheric effects, Antenna phase center offset and variation, Multipath, system accuracy characteristics, Data formats, Error budget.(C2, Understand); (C1, Remember, C4, Analyzed)
4	Planning a GNSS Survey, Positioning methods – point positioning, relative positioning, Static, Differential, RTK, and Field data collection. Ambiguity resolution, Post processing, real time processing, Accuracy measures, software modules, GIS and GNSS data integration, Applications of GNSS(C2, Understand); (C1, Remember, C4, Analyzed)

Teaching - Learning Strategies	Contact Hours
Lecture	26
Practical	
Seminar/Journal Club	
Small group discussion (SGD)	
Self-directed learning (SDL) / Tutorial	10
Problem Based Learning (PBL)	5
Case/Project Based Learning (CBL)	
Revision	4
Others If any:	
Total Number of Contact Hours	45

#### **Assessment Methods:**

Formative	Summative
Multiple Choice Questions (MCQ)	Mid Semester Examination 1
Viva-voce	Mid Semester Examination 2
Objective Structured Practical Examination	University Examination
Quiz	Dissertation
Seminars	Multiple Choice Questions (MCQ)
Problem Based Learning (PBL)	Short Answer Questions (SAQ)
Journal Club	Long Answer Question (LAQ)
	Practical Examination & Viva-voce
	Objective Structured Practical Examination

Nature of Assessment	CO1	CO2	CO3	CO4	
Quiz					
VIVA					
Assignment / Presentation	~	~	✓	✓	



Unit test	Jnit test				✓		
Practical Log Book							
Mid Semester Exar	nination 1	<ul> <li>✓</li> </ul>	✓	✓	<ul> <li>✓</li> </ul>		
Mid Semester Exar	mination 2	✓	✓	✓	<ul> <li>✓</li> </ul>		
University Examination	ation	<ul> <li>✓</li> </ul>	✓	✓	<ul> <li>✓</li> </ul>		
Feedback Process		4.	Student	t's Feedb	back		
1.Regular feedback	is taken through various through Mentor Mentee n the semester through G <b>Text Books</b> 1. Rangawala , Building 4,Charotar Publication <b>Reference books</b> 1. P.C.Varghese, Engine 2. S.K.Duggal, Buildin Publishers. 3. Sushil Kumar, Buildi 4. M. S. Shetty, Conce Publishers. 5. A. R. Santhakumar, G	g Constr ns Pvt. I eering M ng Mate ng Cons rete Teo	uction (2 .td. 28th Iaterials, rials, 3rc struction, chnology	Edition 1st editi l Edition Standard : Theory	on, PHI I I, New A d Publish 7 and Pra	Learning ge Inter ers Distr actice, S	rnational ibutors. . Chand



		1	Faculty	v of En	gineer	ring &	Technolo	gv			
Name of the l	Depart				Engin			01			
Name of the l	-			Master of Technology in Civil Engineering (Remote							
	8				ng and		0.	U	U V		
<b>Course Code</b>				1316	U	,					
<b>Course Title</b>				Adva	nced S	Survevi	ng and Ca	rtograi	ohy		
Academic Year				II		5	0	0 1			
Semester				III							
Number of Credits     3											
<b>Course Prere</b>	quisite			Adva	nced S	Surveyi	ng				
Course Syno	-						0	allied	l electron	ic equipment,	
	[					•	aphic princ				
Course Outcomes:											
At the end of	the cou	rse stuc	lents w	ill be a	ble to:						
CO1	Identi	fy the pr	rinciple	s of top	ograph	ical map	o preparatio	on			
CO2	Select	electronic surveying									
CO3	Carry	out astronomical observations for accurate surveying									
CO4	Apply	projection and datum parameters for a map ,Map the features with GPS									
Mapping of ( Outcomes:										_	
COs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PS O2	PSO3	PSO4	
CO1	1	-	3	3	3	3	1	-	3	3	
CO2	1	-	3	3	3	3	1	-	3	3	
CO3	1	-	3	3	3	3	1	-	3	3	
<b>CO4</b>	1	-	3	3	3	3	1	-	3	3	
Average	1	-	3	3	3	3	1	-	3	3	
<b>Course Cor</b>	itent:										
L (Hor	urs/Wee	k)		T (Hou	rs/Wee	k)	P (Hours/V	Veek)	Total Hour/Week		
	3				0		0			3	
Unit		Content									
1		Introd	luction	to to	oograp	hical n	napping, s	scale o	of topogra	aphical maps,	
	Indian topographical series and their numbering system, topographical										
		survey methods. Precise level and Precise levelling (C2, Understand);									
		(C1, Remember, C4, Analyzed)									
2		Basic principles, classifications, applications, comparison with									
		conventional surveying. electromagnetic wave theory – electromagnetic									
									-	and EDM	
		instruments, application of Lasers in distance measurement. (C2,									
		1					Analyzed)				
3					•				-	e, coordinate	
		syster	ns, ear	th and	its mo	otions-a	innual, spi	in, pre	cession, n	utation, polar	



	motion. Earth and its gravity field – anomaly, gravity potential, geoid and deflection to vertical. Celestial sphere, meridians and vertical circles, astronomical coordinate systems, astronomical triangle,
	determination of azimuth (C2, Understand); (C1, Remember, C4, Analyzed)
4	Definition, scope and content the spheroid, map scale, co-ordinate system, methods of mapping, relief maps, thematic maps, map projections, classification, principles of construction of common projections, cylindrical, conical, azimutal, and globular projections, properties and uses an choice of projections, plane co-ordinates, UTM system, projection used in Survey of India topographical sheets, map
	reproduction. (C2, Understand); (C1, Remember, C4, Analyzed)

Teaching - Learning Strategies	Contact Hours	
Lecture	26	
Practical		
Seminar/Journal Club		
Small group discussion (SGD)		
Self-directed learning (SDL) / Tutorial	10	
Problem Based Learning (PBL)	5	
Case/Project Based Learning (CBL)		
Revision	4	
Others If any:		
Total Number of Contact Hours	45	

#### **Assessment Methods:**

Formative	Summative
Multiple Choice Questions (MCQ)	Mid Semester Examination 1
Viva-voce	Mid Semester Examination 2
Objective Structured Practical Examination	University Examination
Quiz	Dissertation
Seminars	Multiple Choice Questions (MCQ)
Problem Based Learning (PBL)	Short Answer Questions (SAQ)
Journal Club	Long Answer Question (LAQ)
	Practical Examination & Viva-voce
	Objective Structured Practical Examination

Nature of Assessment	CO1	CO2	CO3	CO4	
Quiz					
VIVA					



Assignment / Presentation		✓	✓	✓	✓				
Unit test			✓	✓	✓				
Practical Log Book/ Record Book									
Mid Semester Exam	mination 1	✓	✓	✓	<ul> <li>✓</li> </ul>				
Mid Semester Examination 2			✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>				
University Examination			✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>				
		1	I	1	1	1			
Feedback Process		1. Student's Feedback							
Students Feedback	is taken through various	steps							
	through Mentor Mentee	-							
2.Feedback betwee	en the semester through go	ogle fo	orms						
References:									
	Text Books								
	1. Gopi, "Advanced surveying: Total station, GIS and Remote Sensing",								
	Pearson Education India, 2007.								
	2.Borden D. Dent, Jeffrey Troguson, Thomas W. Hodler, "Cartography:								
	Thematic map Design", McGraw-Hill Higher Education, 2008. Reference								
	books								
	3. Hoffman. B, H. Licht	enegga	and J. C	ollins, "C	Global Po	sitioning	g System		
	– Theory and Practice",	Spring	er – Verla	ag Publis	hers, 200	)1.			
	4. Wolfgang Torge, "Ge	odesy	, Berlin:	de Gruyt	er, 2001.				



		I	Faculty	y of En	igineer	ring & '	Technolo	gy		
Name of the	Depart	ment		Civil	Engin	eering				
Name of the	Progra	m		Master of Technology in Civil Engineering (Remote						
				Sensi	ng and	I GIS)				
<b>Course Code</b>				1316	0376					
<b>Course Title</b>				Patte	rn Rec	ognitio	n and Mac	hine I	Learning	
Academic Ye	ar			II						
Semester				III						
Number of Credits				3						
Course Prerequisite				Adva	nced S	Surveyir	ıg			
Course Syno	psis			This	course	aims to	provide	studen	ts with a	comprehensive
	_									chine learning
										ta. The course
										and practical
								t of	civil eng	gineering and
Course Outcomes:				enviro	Jiment	al monit	oring.			
		ree stuc	lents u	vill be a	ble to					
CO1	the course students will be able to: Understand problem framing, feature selection, and dimensionality reduction									
COI		methods like PCA.								
CO2		re discriminative classifiers such as LDA, Multi-layer perceptron, back								
001	-	gation,				o a o n a o	2211,1141		- percepti	,
CO3	· · ·	<u> </u>			ng tech	niques l	like cluste	ring, V	ector Quar	ntization,
		ien Map						0.	ç	·
CO4	Learn	about g	generat	tive mo	dels, p	robabili	stic graph	ical m	odels, and	density
	estim									
Mapping of C	Course	Outco	mes (C	COs) to	Prog	ram Ou	tcomes (l	POs) &	& Program	n Specific
Outcomes:										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PS	PSO3	PSO4
COS	101	102	105	104	105	100	1501	02	1505	1504
CO1	1	-	3	3	3	3	1	-	3	3
CO2	1	-	3	3	3	3	1	-	3	3
CO3	1	-	3	3	3	3	1	-	3	3
CO4	1	-	3	3	3	3	1	-	3	3
Average	1	-	3	3	3	3	1	-	3	3
<b>Course Con</b>	ntent:									
L (Ho	urs/Wee	k)		T (Hou	rs/Wee	<b>k</b> )	P (Hours/V	Veek)	Total	Hour/Week
3				0		0	,		3	
Unit						(	Content		1	
1		Defin	ition a	nd Sco	pe of P	Pattern H	Recognitio	on and	Machine	Learning
						Evolutio				ũ
		Appli	cations	s in Civ	vil Eng	gineerin	g with en	phasis	s on Remo	ote Sensing &
					-		-	-		- C
GIS (C2, Understand); (C1, Remember, C4, Analyzed)										



2	Types of Machine Learning: Supervised, Unsupervised, and Semi-					
	supervised					
	Feature Selection and Extraction in Geospatial Data					
	Model Evaluation Metrics for Remote Sensing Applications. (C2,					
	Understand); (C1, Remember, C4, Analyzed)					
3	Linear Regression and its Applications, Decision Trees, Random					
	Forests, and their use in Land Cover Classification, Support Vector					
	Machines for Spatial Data Analysis, Introduction to Neural Networks in					
	Remote Sensing (C2, Understand); (C1, Remember, C4, Analyzed)					
4	Clustering Techniques (K-means, Hierarchical) for Unsupervised					
	Learning, Principal Component Analysis (PCA) in Geospatial Analysis					
	Spatial-Temporal Analysis using Machine Learning, Case Studies and					
	Real-world Projects (C2, Understand); (C1, Remember, C4, Analyzed)					

Teaching - Learning Strategies	Contact Hours				
Lecture	26				
Practical					
Seminar/Journal Club					
Small group discussion (SGD)					
Self-directed learning (SDL) / Tutorial	10				
Problem Based Learning (PBL)	5				
Case/Project Based Learning (CBL)					
Revision	4				
Others If any:					
Total Number of Contact Hours	45				

#### **Assessment Methods:**

Formative	Summative
Multiple Choice Questions (MCQ)	Mid Semester Examination 1
Viva-voce	Mid Semester Examination 2
<b>Objective Structured Practical Examination</b>	University Examination
Quiz	Dissertation
Seminars	Multiple Choice Questions (MCQ)
Problem Based Learning (PBL)	Short Answer Questions (SAQ)
Journal Club	Long Answer Question (LAQ)
	Practical Examination & Viva-voce
	<b>Objective Structured Practical Examination</b>

Nature of Assessment	CO1	CO2	CO3	CO4	
Quiz					



NAAC	5
A+	/

VIVA								
Assignment / Pres	✓	✓	✓	✓				
Unit test	<ul> <li>✓</li> </ul>	✓	✓	<ul> <li>✓</li> </ul>				
Practical Log Boo	k/ Record Book							
Mid Semester Exa	mination 1	<ul> <li>✓</li> </ul>	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>			
Mid Semester Exa	Mid Semester Examination 2			✓	✓			
University Examin	nation	<ul> <li>✓</li> </ul>	✓	✓	<ul> <li>✓</li> </ul>			
Feedback Process	5	1. Student's Feedback						
1.Regular feedbac	t is taken through various k through Mentor Mente en the semester through	e system						
References:								
	<ul> <li>Text Books</li> <li>S. Marsland, "Machine Learning: An Algorithmic Perspective," Chapman &amp; Hall/CRC, 2009.</li> <li>R. O. Duda, P. E. Hart, and D. G. Stork, "Pattern Classification," 2nd Edn., Wiley India, 2007</li> <li>Reference books</li> <li>C. Bishop, "Pattern Recognition and Machine Learning," Springer, 2006.</li> <li>I. H. Witten, "Data Mining: Practical Machine Learning Tools And Techniques," 2nd Edn., Elsevier India, 2008.</li> </ul>							



### **SEMESTER - IV**

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Course Code	Course Title
13160432	Dissertation Phase-II



Faculty of Engineering & Technology													
Name of th		Civil Engineering											
Name of the Program				Mast	Master of Technology in Civil Engineering (Structural								
0				Engi	Engineering)								
Course Co	de			1316	13160432								
<b>Course Tit</b>	tle			Disse	Dissertation Phase-II								
Academic	Year			II	II								
Semester				IV	IV								
Number of	f Cred	its		1	1								
<b>Course Pr</b>	erequi	isite		NIL									
Course Sy	nopsis			In th	is cour	se, stu	ident wi	ill compl	ete the tl	nesis work.			
Course Ou	itcome	es:		•				1					
At the end	of the	course	stude	ents wil	l be ab	ble to:							
CO1	Ident	ify civ	il eng	gineerin	g prob	lems t	y revie	wing ava	ailable lit	erature.			
CO2	Ident	ify app	propri	iate tech	nique	s to an	alyze co	omplex p	oroblems	related to civil			
	engir	gineering											
CO3	Inves	stigate	and d	levelopi	nent o	f solut	ion						
		-						comes (	POs) &	Program Specific			
Outcomes				,	,	0		,	,				
COs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4			
CO1	3	3	3	3	3	3	3	3	3	3			
CO2	3	3	3	3	3	3	3	3	3	3			
CO3	3	3	3	3	3	3	3	3	3	3			
Average	3	3	3	3	3	3	3	3	3	3			
Course C	Conte	nt:											
L (Hours/Week)			T (Hou	T (Hours/Week)		P (Hours/Week)		.)	Total Hour/Week				
0				0 2 1					1				
Experiment					Content								
No.													
1.		Identify the problem (C2, Understand), Implement the suitable solution											
				• • •			l tests (	C4, Ana	lyze), In	vestigate and develop			
		the s	olutic	on (C6, 9	Create	2)							

Teaching - Learning Strategies	Contact Hours			
Lecture				
Practical	-			
Seminar/Journal Club				
Small group discussion (SGD)				
Self-directed learning (SDL) / Tutorial	-			
Problem Based Learning (PBL)	-			



Case/Project Based Learning (CBL)	-
Revision	
Others If any:	
Total Number of Contact Hours	-

#### **Assessment Methods:**

Formative	Summative		
Multiple Choice Questions (MCQ)	Mid Semester Examination 1		
Viva-voce	Mid Semester Examination 2		
Objective Structured Practical Examination	University Examination		
Quiz	Dissertation		
Seminars	Multiple Choice Questions (MCQ)		
Problem Based Learning (PBL)	Short Answer Questions (SAQ)		
Journal Club	Long Answer Question (LAQ)		
	Practical Examination & Viva-voce		
	Objective Structured Practical Examination		

#### Mapping of Assessment with COs

Nature of Assessment	CO1	CO2	CO3	CO4	CO5
Quiz					
VIVA	✓	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓
Assignment / Presentation					
Unit test					
Practical Log Book/ Record Book	✓	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	✓
Demonstration	✓	<ul> <li>✓</li> </ul>	✓	<ul> <li>✓</li> </ul>	✓
Mid Semester Examination 1					
Mid Semester Examination 2					
University Examination (External	✓	<ul> <li>✓</li> </ul>	✓	<ul> <li>✓</li> </ul>	✓
Practical)					
Feedback Process	1. Stu	ident's Fe	edback		
Students Feedback is taken through vari	-				
1. Regular feedback through Mento	•				
2. Feedback between the semester	through Goo	gle forms			



## 9. MAPPING OF COURSE OUTCOMES, PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

Sem.	Course	Course	С	Р	Р	Р	Р	Р	Р	PS	PS	PSO3	PSO4
	Code	Title		0	02	03	04	05	06	01	02		
				1									
Ι	131601	Researc	3	3	3	-	-	-	-	3	3	-	-
	38	h											
		Method											
		ology &											
		IPR											
Ι	131601	Seminar	1										
	07												
Ι	131601	Paveme	3	3	3	2	2	1	1	2	2	3	3
	32	nt											
		Material											
		S											
Ι	131601	Urban		3		2	2.	2.		2	2	3	3
	33	Transpo					6	4					
		rtation											
		System											
		Plannin											
		g											
Ι	131601	Geometr		1.	3	2.	2.	2.	2	2	2	3	3
	34	ic		5		75	75	5					
		Design											
		of											
		Transpo											
		rtation											





		Facilitie s										
I	131601 35	Ground Improve ment	2	3	3	3	2. 5	2	2	2	3	3
II	131601 36	Paveme nt Material s Lab	2. 75	1. 75	2	2. 5	2. 5	1. 75	2	2	3	3
I	131601 37	Geometr ic Design Lab	2. 75	1. 75	2	2. 5	2. 5	1. 75	2	2	3	3
I	131601 14	Advanc e Pre- Stressed Concret e Design	-	-	3	3	3	3	3	3	3	3
I	131601 15	Structur al Dynami cs	-	-	3	3	3	3	3	3	3	3
I	131601 16	Matrix Methods of Structur al	-	-	3	3	3	3	3	3	3	3





		Analysis										
Ι	131601	Design	1	-	3	3	3	3	1	-	3	3
1	17	of										
1		Concret										
1		e										
1		Structur										
1		al										
		Systems										
Ι	131601	Matrix	-	-	3	3	3	3	3	3	3	3
1	18	Methods										
1		of										
1		Structur										
1		al										
1		Analysis										
1		Lab										
1		(STAA										
1		D PRO)										
Ι	131601	Design	1	-	3	3	3	3	1	-	3	3
1	19	of										
1		Concret										
1		e and										
1		Structur										
1		al										
l		Systems										
l		Lab										
l		(STAA										
		D PRO)										
Ι	131601	Principl	 3	1.	-	-	-	-	-	-	1	1





	43	es of		75								
		Remote										
		Sensing										
Ι	131601	Geograp	1	1.	1	1	2	-	-		1	1
	08	hical		25								
		Informat										
		ion										
		Systems										
Ι	131601	Photogr	3.	1.	2.	3	2	1	-	1.	2.5	2.0
	39	ammetr	0	8	3					3		
		у										
Ι	131601	Applicat	2	3	2.	0.	1.	2.	-	2	3.0	1.5
-	40	ion of	-	U	5	8	5	5		-	2.0	110
	10	Remote			5	0	•	•				
		Sensing										
		Sensing										
Ι	131601	Geograp	3.	1.	2.	0.	1.	0.	-	1.	2.5	0.5
	41	hical	0	8	3	8	0	5		3		
		Informat										
		ion										
		Systems										
		Lab										
	121/01	Dlast		1		•	1	•		1	2.5	0.7
Ι	131601	Photogr	3.	1.	2.	0.	1.	0.	-	1.	2.5	0.5
	42	ammetr	0	8	3	8	0	5		3		
		y Lab										
II	131602	Minor	3	3	2	3	3	3	3	3	2	3
	38	Project										





II	131602 32	Analysis and Design of Paveme nt	2	1	3	3	3	1	2	2	3	3
П	131602 33	Transpo rt Econom ics	2	2	2	3	2	2	2	2	3	3
II	131602 34	Traffic Enginee ring and Manage ment	3	1	3	3	2	2	2	2	3	3
Π	131602 35	Airport Infrastru cture, Plannin g and Design	2.5	2.	2. 5	3	2	2	2	2	3	3
Π	131602 36	Paveme nt Design Lab	2. 75	1. 75	2	2. 5	2. 5	1. 75	2	2	3	3
II	131602 37	Traffic Lab	2. 75	2	2. 25	2. 5	2. 5	2	2	2	3	3





II	131602 32	Analysis and Design of Paveme	1	-	3	3	3	3	1	-	3	3
II	131602 33	nt Transpo rt Econom ics	1	-	3	3	3	3	1	-	3	3
II	131602 34	Traffic Enginee ring and Manage ment	3	1	3	3	2	2	2	2	3	3
II	131602 35	Airport Infrastru cture, Plannin g and Design	2. 5	2. 75	2.5	3	2	2	2	2	3	3
Π	131602 36	Paveme nt Design Lab	2. 75	1. 75	2	2. 5	2. 5	1. 75	2	2	3	3
II	131602 37	Traffic Lab	2. 75	2	2. 25	2. 5	2. 5	2	2	2	3	3



1

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3

3

3

3

1

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Π

131602

14

Finite

Element



3

3

Analysis Π 131602 Theory 3 3 3 3 3 3 1 1 -of 15 Elasticit y and Plasticit y Π 131602 Limit 3 3 3 3 3 3 1 -1 -16 State Design of Steel Structur es Earthqu Π 131602 1 3 3 3 3 3 3 3 3 -17 ake Resistan t Design Π 131602 Structur 3 3 3 3 3 1 1 3 1 1 18 al Enginee ring lab (CASTI NG) Finite 131602 Π 3 3 3 3 3 3 1 -1 -Element 39

Analysis





II       131602       Geospat       3       1.       1       2       -       -       -       1         40       ial Data       75       75       75       1       1       2       -       -       -       1         40       ial Data       75       75       1       1       2       -       -       -       1         9rocessi       ng and       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1	
Processi       ng and       ng and       ng and       ng and       ng and       ng	. 2
ng and Modelli ng       ng	. 2
Modelli       Modelli       Modelli       Image	. 2
ng         I         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O         O	. 2
II       131602       Satellite       1.       -       0.       -       0.       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -	. 2
41         Image         75         25         75         75           Processi         Image         Image	. 2
Processi	
ng	
II 131602 Advanc 2 0. 1 0. 3 3	3.0 2.0
42         ed GIS         75         75	
II     131602     GPS &     2     1     1     0.     3     -     -     2     3	3 1
43 Surveyi 75	
ng	
II         131602         Advanc         2         1         1         3         -         -         2         3	3 1
44 ed GIS	
Lab	
II 131602 Satellite <b>3 3 3 3 3 3 2</b>	2.5 2.5
45 Image	
Processi	
ng Lab	
III         131603         Disserta         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3	3 3
67 tion	
Phase-I	





III	131603	Intellige	2.	2.	2	2	1.	1.	2	2	3	3
	57	nt	8	4			4	2				
		Transpo										
		rtation										
		Systems										
III	131603	Constru	2.	2.	2.	3	2	2	2	2	3	3
	55	ction	5	75	5							
		Project										
		Manage										
		ment &										
		ВОТ										
III	131603	Traffic	3	2	2	3	2	2	2	2	3	3
	68	Manage										
		ment										
		and										
		Road										
		safety										
III	131603	Highwa	1	2	3	1	2	2	2	3	3	
	59	у										
		Constru										
		ction										
		Practice										
		s										
III	131603	Paveme	2.	2	2	2.	2.	2.	2	2	3	3
	69	nt	75			25	5	25				
		Evaluati										
		on,										
		Rehabili										





		tation & Mainten ance										
III	131603 63	Environ ment Impact Assessm ent	2	2	1	1	2	2	2	2	3	3
III	131603 65	Bridge Enginee ring	3	2	2	2	2	2	2	2	3	3
	131603 05	Theory & Design of Plate and Shell	1	-	3	3	3	3	1	-	3	3
III	131603 25	Pre- Fabricat ed Structur es	1	-	3	3	3	3	1	-	3	3
III	131603 27	Design of Industri al Structur	1	-	3	3	3	3	1	-	3	3





		es										
III	131603	Mainten	1	-	3	3	3	3	1	-	3	3
	29	ance &										
		Rehabili										
		tation of										
		Structur										
		es										
III	131603	Design	 1	-	3	3	3	3	1	-	3	3
	31	of										
		Bridges										
III	131603	Compos	1	-	3	3	3	3	1	-	3	3
	33	ite										
		Structur										
		es										
III	131603	Design	1	-	3	3	3	3	1	-	3	3
	35	of Tall										
		Building										
		S										
III	131603	Digital	1	-	3	3	3	3	1	-	3	3
	70	Image										
		Processi										
		ng										
III	131603	Web	1	-	3	3	3	3	1	-	3	3
	71	and										
		Mobile										
		GIS										





III	131603	Argo	1	-	3	3	3	3	1	-	3	3
	72	Remote			C	Ũ	C	C	-		Č	U
	12											
		Sensing										
III	131603	Remote	1	-	3	3	3	3	1	-	3	3
	73	Sensing										
		Geology										
III	131603	Global	1	-	3	3	3	3	1	-	3	3
	74	Navigati										
		on										
		Satellite										
		System										
111	121(02	A 1	1		2	2	2	2	1		2	2
III	131603	Advanc	1	-	3	3	3	3	1	-	3	3
	75	ed										
		Surveyi										
		ng and										
		Cartogra										
		phy										
III	131603	Pattern	1	-	3	3	3	3	1	-	3	3
	76	Recogni										
		tion and										
		Machine										
		Learnin										
		g										
IV	131604	Disserta	3	3	3	3	3	3	3	3	3	3
	32	tion										
		Phase-II										

Note: C-Credits