KONGUNADU COLLEGE OF ENGINEERING AND TECHNOLOGY

(AUTONOMOUS)

Namakkal-Trichy State Highway, Tholurpatti Post, Thottiam Taluk, Trichy District.

DEPARTMENT OF CIVIL ENGINEERING

CURRICULA & SYLLABI
R2024

Kongunadu College of Engineering and Technology (Autonomous)
Affiliated to Anna University, Chennai
B.E. Civil Engineering
Regulations: R2024
Choice Based Credit System
I to VIII Semesters Curricula & Syllabi
(Applicable for the students Admitted from 2024-25 Onwards)

Semester I

S. No	Course Code	Course Title	Course Category	No of Periods/Week			Total Contact Periods	Credits
				L	T	P		
1	24MC001	Induction Programme	MC	-	-	-	-	0
Theory								
2	24EN101	Communicative English	HSMC	3	0	0	3	3
3	24MA101	Matrices and Calculus	BSC	3	1	0	4	4
4	24PH101	Engineering Physics	BSC	3	0	2	5	4
5	24CY101	Engineering Chemistry	BSC	3	0	2	5	4
6	24GE102	Engineering Graphics	ESC	3	0	2	5	4
7	24TA101	தமிழர் மரபு / Heritage of Tamils	HSMC	1	0	0	1	1
Practicals								
8	24GE104L	Engineering Practices Laboratory	ESC	0	0	4	4	2
9	24EEC101L	Interpersonal Communication Laboratory	EEC	0	0	2	2	1
			Total	16	1	12	29	23

Semester II

S. No	Course Code	Course Title	Course Category	No of Periods/Week			Total Contact Periods	Credits
				L	T	P		
Theory								
1	24EN201	Technical English	HSMC	3	0	0	3	3
2	24MA203	Vector Calculus and Science	BSC	3	1	0	4	4
3	24MC002	Universal Human Values-2 Understanding Harmony	MC	2	1	0	3	3
4	24CY201	Environmental Sciences	BSC	3	0	0	3	3
5	24GE101	Computer Fundamentals and C Programming	ESC	3	0	0	3	3
6	24CE201	Engineering Mechanics	PCC	3	1	0	4	4
7	24TA201	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	HSMC	1	0	0	1	1
Practicals								
8	24GE103L	C Programming Laboratory	ESC	0	0	3	3	1.5
9	24CE202L	Building Drafting and Modeling Laboratory	PCC	0	0	3	3	1.5
10	24EEC201L	Professional Communication Laboratory	EEC	0	0	2	2	1
			Total	18	2	8	29	25

CHAIRMAN
BoS (CIVIL) 03/ 25

Semester III

S. No	Course Code	Course Title	Course Category	L	T	P	Total Contact Periods	Credits
Theory								
1	24MA303	Transforms and Partial Differential Equations	BSC	3	1	0	4	4
2	24CE301	Strength of Materials-I	PCC	3	0	0	3	3
3	24CE302	Mechanics of Fluids	PCC	3	0	0	3	3
4	24CE303	Surveying	PCC	3	0	0	3	3
5	24CE304	Construction Materials and Technology	PCC	3	0	0	3	3
6	24CE305	Engineering Geology	ESC	3	0	0	3	3
Practicals								
7	24CE306L	Surveying Laboratory	PCC	0	0	2	2	1
8	24EEC301L	Soft Skills Development	EEC	0	0	2	2	1
			Total	**18**	**1**	**4**	**23**	**21**

Semester IV

S. No	Course Code	Course Title	Course Category	L	T	P	Total Contact Periods	Credits
Theory								
1	24MA401	Numerical Methods	BSC	3	1	0	4	4
2	24CE401	Strength of Materials-II	PCC	3	1	0	4	4
3	24CE402	Applied Hydraulic Engineering	PCC	3	0	0	3	3
4	24CE403	Soil Mechanics	PCC	3	0	0	3	3
5	24CE404	Construction Techniques, Equipments and Practice	PCC	3	0	0	3	3
6	24MC003	Constitution of India	MC	2	0	0	2	0
Practicals								
7	24CE405L	Strength of Materials Laboratory	PCC	0	0	2	2	1
8	24CE406L	Hydraulic Engineering Laboratory	PCC	0	0	2	2	1
9	24CE407L	Survey Camp (2 weeks -During III Semester)	PCC	0	0	0	0	1
10	24EEC401L	Life Skills and Personality Development	EEC	0	0	2	2	1
			Total	**17**	**2**	**6**	**25**	**21**

CHAIRMAN
BoS (CIVIL)

Semester V

S. No	Course Code	Course Title	Course Category	No of Periods/Week			Total Contact Periods	Credits
				L	T	P		
Theory								
1	24CE501	Design of Reinforced Concrete Structural Elements	PCC	3	1	0	4	4
2	24CE502	Structural Analysis-I	PCC	3	0	0	3	3
3	24CE503	Environmental Engineering-I	PCC	3	0	0	3	3
4	24CE504	Foundation Engineering	PCC	3	0	0	3	3
5		Professional Elective-I	PEC	3	0	0	3	3
6		Open Elective-I	OEC	3	0	0	3	3
Practicals								
7	24CE505L	Geotechnical Engineering Laboratory	PCC	0	0	2	2	1
8	24EEC501L	Professional Skills Development	EEC	0	0	2	2	1
			Total	18	1	6	25	21

Semester VI

S. No	Course Code	Course Title	Course Category	No of Periods/Week			Total Contact Periods	Credits
				L	T	P		
Theory								
1	24CE601	Design of Steel Structural Elements	PCC	3	1	0	4	4
2	24CE602	Structural Analysis-II	PCC	3	0	0	3	3
3	24CE603	Environmental Engineering-II	PCC	3	0	2	5	4
4		Professional Elective-II	PEC	3	0	0	3	3
5		Professional Elective-III	PEC	3	0	0	3	3
6		Open Elective-II	OEC	3	0	0	3	3
Practicals								
7	24CE604L	Mini Project-I	EEC	0	0	2	2	1
8	24EEC601L	Employability Skills	EEC	0	0	2	2	1
			Total	18	1	4	23	22

CHAIRMAN
BoS (CIVIL)

Semester VII

S. No	Course Code	Course Title	Course Category	No of Periods/Week			Total Contact Periods	Credits
				L	T	P		
Theory								
1	24CE701	Estimation Costing and Valuation Engineering	PCC	3	0	0	3	3
2	24CE702	Transportation Engineering	PCC	3	0	0	3	3
3	24CE703	Concrete Technology	PCC	3	0	0	3	3
4		Professional Elective-IV	PEC	3	0	0	3	3
5		Professional Elective-V	PEC	3	0	0	3	3
Practicals								
6	24CE704L	Concrete and HighwayEngineering Laboratory	PCC	0	0	3	3	1.5
7	24CE705L	Structural Design and Drawing	PCC	0	0	3	3	1.5
8	24CE706L	Mini Project-II	EEC	0	0	2	2	1
			Total	15	0	8	23	19

Semester VIII

S. No	Course Code	Course Title	Course Category	No of Periods/Week			Total Contact Periods	Credits
				L	T	P		
Theory								
1		Professional Elective-VI	PEC	3	0	0	3	3
2		Professional Elective - VII	PEC	3	0	0	3	3
Practicals								
3	20CE801L	Project Work	EEC	0	0	20	20	10
			Total	6	0	20	26	16

CHAIRMAN
BoS (CIVIL)

PROFESSIONAL ELECTIVE COURSES: VERTICALS

	Vertical 1	Vertical 2	Vertical 3	Vertical 4	Vertical 5	Vertical 6	Vertical 7	Vertical 8
	Water Resources Management	Civil Engineering Management	Environment	Transportation	Structures	Geotechnical	Construction Techniques and Practices	Diversified Course
	24CE501PE Integrated Water Resources Management	Engineering Economics	24CE602PE Disaster Management	24CE701PE Intelligent Transportation Systems	24CE708PE Prefabricated Structures	24CE801PE Earth and Rockfill Dams	24CE808PE Maintenance and Repair of Concrete Structures	24CE609PE Irrigation and Environmental Engineering Design and Drawing
	24CE502PE Watershed Management	Leadership and Team Effectiveness	24CE603PE Irrigation Engineering	24CE702PE Metro Engineering; Rehabilitation of Civil Infrastructure	24CE709PE Retrofitting and Rehabilitation of Civil Infrastructure	24CE802PE Geo-Environmental Engineering	24CE809PE Energy Efficient Buildings	24CE815PE Admixtures and Special Concretes
	24CE503PE Groundwater Engineering	Total Quality Management	24CE604PE Municipal Solid Waste Management	24CE703PE Bridge Engineering	24CE710PE Prestressed Concrete Structures	24CE803PE Marine Geotechnical Engineering	24CE810PE Modern Construction Materials	24CE816PE Soil Pollution Engineering
	24CE504PE Rural Water Resources Management	Professional Ethics in Engineering	24CE605PE Wastewater Treatment and Recycling	24CE704PE Traffic Engineering and Management	24CE711PE Design of Masonry Structures	24CE804PE Ground Improvement Techniques	24CE811PE Advanced Construction Techniques	24CE508PE Water Quality and Management
	24CE505PE Hydrology and Water Resources Engineering	Safety and Risk Analytics / Engineering	24CE606PE Air Pollution and Control Engineering	24CE705PE Transportation Planning	24CE712PE Industrial Structures	24CE805PE Earthquake Geotechnical Engineering	24CE812PE Construction Planning and Scheduling	24CE715PE AI in Civil Engineering
	24CE506PE Coastal Engineering	Principles of Management	24CE607PE Environmental Impact Assessment	24CE706PE Geometric Design of Highway	24CE713PE Green Construction	24CE806PE Geotextile Engineering	24CE813PE Safety in Civil Engineering Practices	24CE716PE Town Planning and Urban Development
	24CE507PE Availability of Management and Groundwater Resources	24CE601PE Construction Management and Safety	24CE608PE Hazardous Waste Management	24CE707PE Pavement Engineering	24CE714PE Structural Dynamics and Earthquake Engineering	24CE807PE Tunnel Engineering	24CE814PE Smart Materials	24CE610PE Environmental Policy and Legislations

CHAIRMAN
BoS (CIVIL) 03/04/25

Registration of Professional Elective Courses from Verticals:

- Professional Elective Courses will be registered in Semesters V to VIII. These courses are listed in groups called verticals that represent a particular area of specialization / diversified group. Students are permitted to choose all the Professional Electives from a particular vertical or from different verticals. Further, only one Professional Elective course shall be chosen in a semester horizontally (row-wise). However, two courses are permitted from the same row.

- The registration of courses for B.E./B.Tech (Honours) or Minor degree shall be done from Semester V to VIII. The procedure for registration of courses explained above shall be followed for the courses of B.E./B.Tech (Honours) or Minor degree also.

CHAIRMAN
BoS (CIVIL)

Vertical 1: Water Resources

S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
1	24CE501PE	Integrated Water Resources Management	PEC	3	0	0	3
2	24CE502PE	Watershed Management	PEC	3	0	0	3
3	24CE503PE	Groundwater Engineering	PEC	3	0	0	3
4	24CE504PE	**Rural Water Resources Management**	PEC	3	0	0	3
5	24CE505PE	Hydrology and Water Resources Engineering	PEC	3	0	0	3
6	24CE506PE	Coastal Engineering	PEC	3	0	0	3
7	24CE507PE	**Availability of Management and Groundwater Resources**	PEC	3	0	0	3

Vertical 2: Civil Engineering Management

S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
1		Engineering Economics	PEC	3	0	0	3
2		**Leadership and Team Effectiveness**	PEC	3	0	0	3
3		Total Quality Management	PEC	3	0	0	3
4		Professional Ethics in Engineering	PEC	3	0	0	3
5		**Safety and Risk Analytics**	PEC	3	0	0	3
6		Principles of Management	PEC	3	0	0	3
7	24CE601PE	Construction Management and Safety	PEC	3	0	0	3

CHAIRMAN
BoS (CIVIL) 03/04/25

Vertical 3: Environment

S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
1	24CE602PE	Disaster Management	PEC	3	0	0	3
2	24CE603PE	Irrigation Engineering	PEC	3	0	0	3
3	24CE604PE	**Municipal Solid Waste Management**	PEC	3	0	0	3
4	24CE605PE	**Wastewater Treatment & Recycling**	PEC	3	0	0	3
5	24CE606PE	Air Pollution and Control Engineering	PEC	3	0	0	3
6	24CE607PE	Environmental Impact Assessment	PEC	3	0	0	3
7	24CE608PE	Hazardous Waste Management	PEC	3	0	0	3

Vertical 4: Transportation

S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
1	24CE701PE	Intelligent Transportation Systems	PEC	3	0	0	3
2	24CE702PE	Metro Engineering	PEC	3	0	0	3
3	24CE703PE	Bridge Engineering	PEC	3	0	0	3
4	24CE704PE	Traffic Engineering and Management	PEC	3	0	0	3
5	24CE705PE	Transportation Planning	PEC	3	0	0	3
6	24CE706PE	**Geometric Design of Highway**	PEC	3	0	0	3
7	24CE707PE	Pavement Engineering	PEC	3	0	0	3
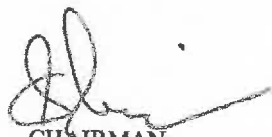
CHAIRMAN
BoS (CIVIL)

Vertical 5: Structures

S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
1	24CE708PE	Prefabricated Structures	PEC	3	0	0	3
2	24CE709PE	**Retrofitting and Rehabilitation of Civil Infrastructure**	PEC	3	0	0	3
3	24CE710PE	Prestressed Concrete Structures	PEC	3	0	0	3
4	24CE711PE	**Design of Masonry Structures**	PEC	3	0	0	3
5	24CE712PE	Industrial Structures	PEC	3	0	0	3
6	24CE713PE	Green Construction	PEC	3	0	0	3
7	24CE714PE	Structural Dynamics and Earthquake Engineering	PEC	3	0	0	3

Vertical 6: Geotechnical

S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
1	24CE801PE	Earth and Rockfill Dams	PEC	3	0	0	3
2	24CE802PE	Geo - Environmental Engineering	PEC	3	0	0	3
3	24CE803PE	Marine Geotechnical Engineering	PEC	3	0	0	3
4	24CE804PE	Ground Improvement Techniques	PEC	3	0	0	3
5	24CE805PE	**Earthquake Geotechnical Engineering**	PEC	3	0	0	3
6	24CE806PE	Geotextile Engineering	PEC	3	0	0	3
7	24CE807PE	Tunnel Engineering	PEC	3	0	0	3

CHAIRMAN
BoS (CIVIL) 03/04/25

Vertical 7: Construction Techniques and Practices

S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
1	24CE808PE	**Maintenance and Repair of Concrete Structures**	PEC	3	0	0	3
2	24CE809PE	Energy Efficient Buildings	PEC	3	0	0	3
3	24CE810PE	**Modern Construction Materials**	PEC	3	0	0	3
4	24CE811PE	Advanced Construction Techniques	PEC	3	0	0	3
5	24CE812PE	Construction Planning and Scheduling	PEC	3	0	0	3
6	24CE813PE	Safety in Civil Engineering Practices	PEC	3	0	0	3
7	24CE814PE	Smart Materials	PEC	3	0	0	3

Vertical 8: Diversified Course

S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
1	24CE609PE	Irrigation and Environmental Engineering Design and Drawing	PEC	3	0	0	3
2	24CE815PE	**Admixtures and Special Concretes**	PEC	3	0	0	3
3	24CE816PE	Soil Pollution Engineering	PEC	3	0	0	3
4	24CE508PE	Water Quality and Management	PEC	3	0	0	3
5	24CE715PE	AI in Civil Engineering	PEC	3	0	0	3
6	24CE716PE	Town Planning and Urban Development	PEC	3	0	0	3
7	24CE610PE	Environmental Policy and Legislations	PEC	3	0	0	3

CHAIRMAN
BoS (CIVIL)

SUMMARY

S No	Course Category	Credits As Per Semester								Total Credit		Percentage
		I	II	III	IV	V	VI	VII	VIII	As per Syllabus	As Per AICTE Model	
1.	HSMC	4	4	-	-	-	-	-	-	8	6	4.76
2.	BSC	12	7	4	4	-	-	-	-	27	24	16.07
3.	ESC	6	4.5	3	-	-	-	-	-	13.5	20	8.03
4.	EEC	1	1	1	1	1	2	1	10	18	16	10.71
5.	PCC	-	5.5	13	16	14	11	12	-	71.5	62	42.55
6.	PEC	-	-	-	-	3	6	6	6	21	26	12.50
7.	OEC	-	-	-	-	3	3	-	-	6	12	3.57
8.	MC	-	3	-	-	-	-	-	-	3	2	1.78
	Total	23	25	21	21	21	22	19	16	168	168	100

CHAIRMAN
BoS (CIVIL)

Open Elective Course (OEC)

(Students shall choose the open elective courses, such that the course contents are not similar to any other course contents/title under other course categories)

Semester V
Open Elective - I

S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
1	24CE501OE	Industrial Waste Management	OEC	3	0	0	3
2	24CE502OE	Ecological Engineering	OEC	3	0	0	3
3			OEC	3	0	0	3
4			OEC	3	0	0	3
5			OEC	3	0	0	3
6			OEC	3	0	0	3
7			OEC	3	0	0	3
8			OEC	3	0	0	3
9			OEC	3	0	0	3
10			OEC	3	0	0	3
11			OEC	3	0	0	3
12			OEC	3	0	0	3

Semester VI
Open Elective - II

S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
1	24CE601OE	Global Warming and Climate Change	OEC	3	0	0	3
2	24CE602OE	Building Services	OEC	3	0	0	3
3			OEC	3	0	0	3
4			OEC	3	0	0	3
5			OEC	3	0	0	3
6			OEC	3	0	0	3
7			OEC	3	0	0	3
8			OEC	3	0	0	3
9			OEC	3	0	0	3
10			OEC	3	0	0	3
11			OEC	3	0	0	3
12			OEC	3	0	0	3

CHAIRMAN
BoS (CIVIL) 03/04/25

ENROLLMENT FOR B.E. / B. TECH. (HONOURS) / MINOR DEGREE (OPTIONAL)

- A student can also optionally register for additional courses (18 credits) and become eligible for the award of B.E. / B. Tech. (Honours) or Minor Degree.
- For B.E. / B. Tech. (Honours), a student shall register for the additional courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination of different verticals of the same programme of study only.
- For minor degree, a student shall register for the additional courses (18 credits) from semester V onwards. All these courses have to be in a particular vertical from any one of the other programmes, Moreover, for minor degree the student can register for courses from any one of the following verticals also.

Vertical for Minor Degree
(In addition to all the verticals of other programmes)

Vertical 1	Vertical 2	Vertical 3	Vertical 4	Vertical 5
Fintech and Block Chain	Entrepreneurship	Public Administration	Business Data Analytics	Environment and Sustainability
Financial Management	Foundations of Entrepreneurship	Principles of Public Administration	Statistics for Management	Sustainable infrastructure Development
Fundamentals of Investment	Team Building and Leadership Management for Business	Elements of Administration	Data mining for Business Intelligence	Sustainable Agriculture and Environmental Management
Banking, Financial Services and Insurance	Creativity and Innovation in Entrepreneurship	Public Personnel Administration	Human Resource Analytics	Sustainable Bio Materials
Introduction to Blockchain and its Applications	Principles of Marketing Management for Business	Administrative Theories	Marketing and Social Media Web Analytics	Materials for Energy Sustainability
Fintech Personal Finance and Payments	Human Resource Management for Entrepreneurs	Indian Administrative System	Operation and Supply Chain Analytics	Green Technology
Introduction to Fintech	Financing New Business Ventures	Public Policy Administration	Financial Analytics	Environmental Quality Monitoring and Analysis
-	-	-	-	Integrated Energy Planning for Sustainable Development
-	-	-	-	Energy Efficiency for Sustainable Development

CHAIRMAN
BoS (CIVIL) 03/04/25

(Choice of courses for Minor degree is to be made from any one vertical of other programmes or from anyone of the following verticals)

VERTICAL 1: FINTECH AND BLOCK CHAIN

S.No.	Course Code	Course Title	Course Category	No. of Hours/Week			Credit
				L	T	P	
1	24M101	Financial Management	PEC	3	0	0	3
2	24M102	Fundamentals of Investment	PEC	3	0	0	3
3	24M103	Banking, Financial Services and Insurance	PEC	3	0	0	3
4	24M104	Introduction to Blockchain and its Applications	PEC	3	0	0	3
5	24M105	Fintech Personal Finance and Payments	PEC	3	0	0	3
6	24M106	Introduction to Fintech	PEC	3	0	0	3

VERTICAL 2: ENTREPRENEURSHIP

S.No.	Course Code	Course Title	Course Category	No. of Hours/Week			Credit
				L	T	P	
1	24M201	Foundations of Entrepreneurship	PEC	3	0	0	3
2	24M202	Team Building and Leadership Management for Business	PEC	3	0	0	3
3	24M203	Creativity and Innovation in Entrepreneurship	PEC	3	0	0	3
4	24M204	Principles of Marketing Management for Business	PEC	3	0	0	3
5	24M205	Human Resource Management for Entrepreneurs	PEC	3	0	0	3
6	24M206	Financing New Business Ventures	PEC	3	0	0	3

VERTICAL 3: PUBLIC ADMINISTRATION

S.No.	Course Code	Course Title	Course Category	No. of Hours/Week			Credit
				L	T	P	
1	24M301	Principles of Public Administration	PEC	3	0	0	3
2	24M302	Elements of Administration	PEC	3	0	0	3
3	24M303	Public Personnel Administration	PEC	3	0	0	3
4	24M304	Administrative Theories	PEC	3	0	0	3
5	24M305	Indian Administrative System	PEC	3	0	0	3
6	24M306	Public Policy Administration	PEC	3	0	0	

CHAIRMAN
BoS (CIVIL)

VERTICAL 4: BUSINESS DATA ANALYTICS

S.No.	Course Code	Course Title	Course Category	No. of Hours/Week			Credit
				L	T	P	
1	24M401	Statistics for Management	PEC	3	0	0	3
2	24M402	Data Mining for Business Intelligence	PEC	3	0	0	3
3	24M403	Human Resource Analytics	PEC	3	0	0	3
4	24M404	Marketing and Social Media Web Analytics	PEC	3	0	0	3
5	24M405	Operation and Supply Chain Analytics	PEC	3	0	0	3
6	24M406	Financial Analytics	PEC	3	0	0	3

VERTICAL 5: ENVIRONMENT AND SUSTAINABILITY

S.No.	Course Code	Course Title	Course Category	No. of Hours/Week			Credit
				L	T	P	
1	24M501	Sustainable infrastructure Development	PEC	3	0	0	3
2	24M502	Sustainable Agriculture and Environmental Management	PEC	3	0	0	3
3	24M503	Sustainable Bio Materials	PEC	3	0	0	3
4	24M504	Materials for Energy Sustainability	PEC	3	0	0	3
5	24M505	Green Technology	PEC	3	0	0	3
6	24M506	Environmental Quality Monitoring and Analysis	PEC	3	0	0	3
7	24M507	Integrated Energy Planning for Sustainable Development	PEC	3	0	0	3
8	24M508	Energy Efficiency for Sustainable Development	PEC	3	0	0	3

CHAIRMAN
BoS (CIVIL) 03/07/25

24MC001	INDUCTION PROGRAMME	L T P C
		- - - 0

This is a mandatory 2 week programme to be conducted as soon as the students enter the institution. Normal classes start only after the induction program is over.

The induction programme has been introduced by AICTE with the following objective:

"Engineering colleges were established to train graduates well in the branch/department of admission, have a holistic outlook, and have a desire to work for national needs and beyond. The graduating student must have knowledge and skills in the area of his/her study. However, he/she must also have broad understanding of society and relationships. Character needs to be nurtured as an essential quality by which he/she would understand and fulfill his/her responsibility as an engineer, a citizen and a human being. Besides the above, several meta-skills and underlying values are needed."

"One will have to work closely with the newly joined students in making them feel comfortable, allow them to explore their academic interests and activities, reduce competition and make them work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and build character. " Hence, the purpose of this programme is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature. The following are the activities under the induction program in which the student would be fully engaged throughout the day for the entire duration of the program.

(i) Physical Activity
This would involve a daily routine of physical activity with games and sports, yoga, gardening, etc.

(ii) Creative Arts
Every student would choose one skill related to the arts whether visual arts or performing arts. Examples are painting, sculpture, pottery, music, dance etc. The student would pursue it every day for the duration of the program. These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, grow into engineering design later.

(iii) Universal Human Values
This is the anchoring activity of the Induction Programme. It gets the student to explore oneself and allows one to experience the joy of learning, stand up to peer pressure, take decisions with courage, be aware of relationships with colleagues and supporting stay in the hostel and department, be sensitive to others, etc. A module in Universal Human Values provides the base. Methodology of teaching this content is extremely important. It must not be through do's and dont's, but get students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real life activities rather than lecturing. Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It would be effective that the faculty mentor assigned is also the faculty advisor for the student for the full duration of the UG programme.

CHAIRMAN
BoS(S&H)

13/05

(iv) Literary Activity

Literary activity would encompass reading, writing and possibly, debating, enacting a play etc.

(v) Proficiency Modules

This would address some lacunas that students might have, for example, English, computer familiarity etc.

(vi) Lectures by Eminent People

Motivational lectures by eminent people from all walks of life should be arranged to give the students exposure to people who are socially active or in public life.

(vii) Visits to Local Area

A couple of visits to the landmarks of the city, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the under privileged.

(viii) Familiarization to Dept./Branch & Innovations

They should be told about what getting into a branch or department means what role it plays in society, through its technology. They should also be shown the laboratories, workshops & other facilities.

(ix) Department Specific Activities

About a week can be spent in introducing activities (games, quizzes, social interactions, small experiments, design thinking etc.) that are relevant to the particular branch of Engineering/Technology/Architecture that can serve as a motivation and kindle interest in building things (become a maker) in that particular field. This can be conducted in the form of a workshop. For example, CSE and IT students may be introduced to activities that kindle computational thinking, and get them to build simple games. ECE students may be introduced to building simple circuits as an extension of their knowledge in Science, and so on. Students may be asked to build stuff using their knowledge of science. Induction Programme is totally an activity based programme and therefore there shall be no tests / assessments during this programme.

References: Guide to Induction program from AICTE

CHAIRMAN
BoS(S&H)

24EN101	COMMUNICATIVE ENGLISH (Common to All Branches)	L T P C 3 0 0 3

OBJECTIVES:
The students should be made to:
- Develop basic communication skills in English.
- Enhance the speaking skills for academic, professional and social purposes.
- Use of the electronic media such as internet and other online resources for their language development.
- Inculcate the habit of reading and writing for the purpose of effective communication
- Develop confidence in learners to communicate in English for all purposes

UNIT I   BASICS OF COMMUNICATION   9
Listening: Basics of listening-Intensive and Extensive Listening, Barriers to Effective Listening; Speaking: Speaking about Future plans- Giving instruction to use the product, Reading: Skimming and Scanning, Writing: Writing about one's leisure time   activities, hometov.n, everyday activities etc., Grammar: Parts of speech, Prepositions, Vocabulary: Word formation.

UNIT II   CREATIVE COMMUNICATION   9
Listening: Listening to short lectures /talks, Speaking: Telephonic interview, Reading: Reading Editorial and Opinion Blogs, Writing: Biographical writing - Writing a paragraph (Cause and Effect/Compare and Contrast/Narrative/Analytical) - Grammar: Gerund and Infinitive - Present Tense, Vocabulary: Abbreviations & Acronyms.

UNIT III   FUNCTIONAL COMMUNICATION   9
Listening: Listening to radio and TV and taking notes - Focused audio 'racks, Speaking: Role Play - Group Interaction, Reading: Reading magazines, Writing: Letter (Informal /Formal – Industrial Visit, Internship, etc),Writing a set of instructions, Grammar: Past Tense -Subject - Verb Agreement, Vocabulary: Question Tags.

UNIT IV   ANALYTICAL SKILLS   9
Listening: Listening to · select talks by eminent personalities, speaking: Speaking in mock Interviews, Reading: Reading advertisements, Writing: Writing a set of recommendations, Interpreting Visual Materials (Line Graphs, Pie Charts etc.), Grammar: Sentence Pattern, Future Tense, Articles, Vocabulary: Single word substitutes.

UNIT V   PROFESSIONAL COMMUNICATION   9
Listening: Understanding different Accents,Listening to TED talks, Speaking: Giving impromptu talks- Making presentations, Reading: Reading and comprehending a passage, Writing: Letter to the editor- Check list, Grammar: Direct and Indirect Speech, Vocabulary: Phrasal Verbs.

TOTAL: 45 PERIODS

CHAIRMAN
BoS (S&H) 19/02/25

OUTCOMES:

On successful completion of the course, the students will be able to,

- Use suitable vocabulary with confidence and express their ideas both in speech and writing.
- Write intelligibly avoiding grammatical errors, using a range of vocabulary, organizing their ideas logically on a topic.
- Speak confidently, with one or many listeners using appropriate communicative strategies.
- Read different genres of texts adopting various reading strategies.
- Understand different spoken discourses/excerpts in different accents.

TEXT BOOKS:

1. Kumar, Sanjay and Lata, Pushp, "Communication Skills", Oxford University Press. 2018.

REFERENCES:

1. DuttP. Kiranmai and Rajeevan Geeta, "Basic Communication Skills", Foundation Books, 2007.
2. Mohan, Krishna and Banerji Meera, "Developing Communication Skills", Macmillan Publishers India Ltd., Delhi: 2009.
3. Martin Hewings "Advanced English Grammar: A self study reference and Practice book for advanced South Asian students" Cambridge University Press, Delhi: 2016.

Mapping of COs with POs

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

CHAIRMAN
BoS (S&H) 19/02/25

24MA101	MATRICES AND CALCULUS	L T P C
	(Common to All Branches)	3 1 0 4

OBJECTIVES:
The students should be made to:
- Introduce the matrix techniques and to illustrate the nature of the matrix.
- Remember the basic concepts of solving algebraic and transcendental equations.
- Apply the formula for the curvature of a curve defined in Cartesian coordinates.
- Analyze the Partial differentiation, concept of total derivative, finding maxima and minima of function of two variables.
- Evaluate the techniques of integration in finding area and volume.

UNIT I   MATRICES   9+3
Eigenvalues and eigenvectors of a real matrix - Properties of eigenvalues and eigenvectors - Cayley-Hamilton theorem (Without proof) - Application of Cayley - Hamilton theorem (A^{-1}, A^n)- Nature of quadratic forms - Reduction of a quadratic form to canonical form by orthogonal transformation.

UNIT II   SYSTEM OF LINEAR EQUATIONS   9+3
Newton Raphson method- Bisection Method -Solution of linear system of equations by matrix method, Gauss-Jordan, Gauss- Jacobi and Gauss-Seidel methods- Eigen values of a matrix by Power method.

UNIT III   DIFFERENTIAL CALCULUS   9+3
Curvature in Cartesian co-ordinates – Centre and radius of curvature – Circle of curvature – Evolutes – Envelopes - Evolute as envelope of normal.

UNIT IV   FUNCTIONS OF SEVERAL VARIABLES   9+3
Partial derivatives - Total derivative - Differentiation of implicit functions - Jacobians - Taylor's series for functions of two variables - Maxima and minima of functions of two variables.

UNIT-V   MULTIPLE INTEGRALS IN CARTESIAN COORDINATES   9+3
Double integration- Change of order of integration- Area between two curves- Triple integration- Volume as triple integrals.

                                                      TOTAL: (45+15) PERIODS

OUTCOMES:
On successful completion of the course, the students will be able to,
- Develop problem-solving skills using systems of equations and matrix transformations.
- Evaluate the efficiency of numerical methods based on the number of iterations required to achieve a desired level of accuracy.
- Compute the radius of curvature and interpret its significance for different types of curves.
- Expand a given function into a series and determine the maximum and minimum of multivariate functions.
- Apply the concepts of double and triple integrals in mathematical and real-world contexts.

CHAIRMAN
BoS (S&H) 19/02/25

TEXT BOOKS:
1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2017.
2. Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2018.

REFERENCES:
1. Kreyszig Erwin, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2018.
2. Sankara Rao. K., "Numerical Methods for Scientists and Engineers", Prentice Hall of India Pvt. Ltd, 4th Edition, New Delhi, 2021.
3. Ramana B V "Higher Engineering Mathematics", New Delhi Tata McGraw- Hill Education India Private Limited., 2021
4. Gerald. C.F., and Wheatley. P.O. "Applied Numerical Analysis" 7th Edition, Pearson Education India, 2017.

Mapping of COs with Pos

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

CHAIRMAN
BoS (S&H) 19/02/25

24PH101   **ENGINEERING PHYSICS**   **L T P C**
                                     (Common to All Branches)   **3 0 2 4**

OBJECTIVES:
The students should be made to:
- Recall the mechanical properties of materials.
- Gain knowledge on electrical properties of materials.
- Understand the properties of magnetic and superconducting materials.
- Examine basic quantum mechanical concepts and their applications.
- Acquire the basic knowledge about nano phase materials and their properties.

UNIT I   MECHANICAL PROPERTIES OF SOLIDS   9
Elasticity and Plasticity - stress-strain diagram and its uses - Hooke's law - factors affecting elastic modulus - bending of beams - bending moment - cantilever: theory and experiment - uniform and non-uniform bending: theory and experiment – I shaped girders and its applications.

UNIT II   ELECTRICAL PROPERTIES OF MATERIALS   9
Classical free electron theory of metals - Electrical conductivity and thermal conductivity of metals - Wiedemann - Franz law - Failures of classical free electron theory - Success of Quantum free electron theory - Fermi distribution function and its variation with temperature - Density of energy states-carrier concentration of metals.

UNIT III   MAGNETIC AND SUPERCONDUCTING MATERIALS   9
Classification of magnetic materials - Domain theory of ferromagnetism - Hysteresis - Soft and Hard magnetic materials - Superconducting materials – Meissner effect - Isotopic effect - BCS theory of superconductors - Type I & Type II superconductors - Applications of superconductors.

UNIT IV   QUANTUM PHYSICS   9
Black body radiation - Planck's theory (derivation) - Deduction of Wien's displacement law and Rayleigh Jeans' Law from Planck's theory-de-Broglie wavelength - Properties of matter waves - Schrodinger's wave equations - Time independent and time dependent wave equations - Physical significance of wave function - Particle in a one dimensional potential box.

UNIT V   NEW ENGINEERING MATERIALS   9
Metallic glasses - Types - Preparation - Properties and applications - Shape Memory Alloys (SMA) - Characteristics and applications - Advantages and disadvantages of shape memory alloys - Synthesis of nanomaterials - Top down approaches (Ball Milling) and Bottom up approaches (CVD and PVD).

TOTAL: 45 PERIODS

CHAIRMAN
BoS (S&H) 19/02/25

LIST OF THE EXPERIMENTS – PHYSICS LABORATORY

1. Determination of Young's modulus of the material by Non-uniform bending method.
2. Determination of Rigidity modulus of the wire using Torsion Pendulum.
3. Determination of band gap energy of a semiconductor.
4. Determination of thickness of the thin film/wire by forming the fringe using Air wedge method.
5. Determination of velocity of ultrasonic waves in a liquid and compressibility of liquid using ultrasonic Interferometer.

TOTAL: 30 PERIODS

OUTCOMES:
On successful completion of the course, the students will be able to,
- Identify the mechanical properties of materials and their significance in engineering applications.
- Interpret the electrical properties of materials and their role in various technological applications.
- Illustrate the magnetic and superconducting properties of materials and their practical implications.
- Apply fundamental quantum mechanical concepts to understand material behavior at the atomic level.
- Explore the properties and applications of smart materials in modern engineering solutions.

TEXT BOOKS:
1. M.N. Avadhanulu, P.G. Kshirsagar, TVS Arun Murthy "A Text book of Engineering Physics", S.Chand and Company Ltd, New Delhi, 11th Edition.2022.
2. Rajendran. V. "Materials Science", McGraw Hill Education (India) Private Limited, New Delhi, 2017.
3. S.O Pillai, "Solid State Physics" New Age International Publishers, New Delhi, 10th Edition, 2022.

REFERENCES:
1. R. K. Gaur and S.L. Gupta, "Engineering Physics", Dhanpat Rai Publications, New Delhi, Reprint 2022.
2. Wahab. M.A, "Solid State Physics' Narosa Publishing House, New Delhi, 4th Edition. 2023.
3. D. Halliday, R. Resnick and J. Walker, Principles of Physics, Wiley (11th Edition), 2020.
4. Malik.K and Singh. A.K, "Engineering Physics" TMH, New Delhi 2nd Edition - 2020.

CHAIRMAN
BoS (S&H) 19/02/25

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS
PHYSICS LABORATORY

S.No.	Name of Equipment	Quantity Required
1	Torsional pendulum with accessories	6 Nos.
2	Non - Uniform bending with accessories	6 Nos.
3	Ultrasonic interferometer.	6 Nos.
4	Air wedge with accessories	6 Nos.
5	Band gap kit	6 Nos.

CHAIRMAN
BoS (S&H) 19/02/25

Mapping of COs with POs

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

CHAIRMAN
BoS (S&H) 19/02/25

| 24CY101 | ENGINEERING CHEMISTRY (Common to All Branches) | L T P C 3 0 2 4 |

OBJECTIVES:

The student should be made to:

- Gain knowledge on various sources of water and its industrial applications.
- Explore the essentials of electrochemistry, types of corrosion and its prevention.
- Examine the fundamentals of polymer, various engineering plastics and composites.
- Study the concept of Phase diagrams, different types of energy storage devices and emerging batteries.
- Assess the types of fuels and its quality estimation.

UNIT I   WATER TECHNOLOGY   9

Sources of water - Hard and soft water - Boiler feed water-requirements - disadvantages of using hard water in boilers (Scale, Sludge, Caustic Embrittlement, Priming and Foaming) - Municipal water treatment (screening, sedimentation, coagulation, filtration and disinfection - ozonolysis, UV treatment, chlorination). Internal conditioning (Phosphate, Calgon, Colloidal and Carbonate conditioning methods) - External conditioning - Zeolite and demineralization process - desalination by reverse osmosis.

UNIT II   ELECTROCHEMISTRY AND CORROSION SCIENCE   9

Electrochemistry - Nernst equation & its Applications - Electrochemical (EMF) series - Corrosion - Types - Chemical and Electrochemical corrosions - Galvanic corrosion - Differential aeration corrosion - Pitting corrosion - Corrosion control - material selection and design - sacrificial anodic method and impressed current cathodic protection method - Organic coatings - Paint and its constituents.

UNIT III   POLYMERS AND COMPOSITES   9

Introduction: Functionality - degree of polymerization. Classification of polymers (Source, Structure, Synthesis and Intermolecular forces) - Mechanism of free radical polymerization - Engineering Plastics: Polyamides, Polycarbonates and Polyurethanes.
Composites: Need, Composition of composites - Definition, examples and applications of Metal matrix composites (MMC), Ceramic matrix composites (CMC) and Polymer matrix composites (PMC)
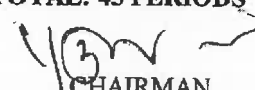
UNIT IV   PHASE RULE AND ENERGY STORAGE DEVICES   9

Phase Rule - Terms involved - One Component system (water system) - Two component system (Lead-Silver system) - Storage devices - types - primary battery (dry cell), secondary battery (lead acid, lithium-ion battery) - Emerging batteries - Aluminum air battery, batteries for automobiles and satellites - Fuel cells - Hydrogen - Oxygen fuel cell.

UNIT V   FUELS AND COMBUSTION   9

Fuels – Introduction - Classification of fuels - coal - Analysis of coal (proximate and ultimate) - Carbonization - Manufacture of metallurgical coke (Otto Hoffmann method) - Petroleum - Manufacture of synthetic petrol (Bergius process) - Knocking - Anti knocking - Octane number - Cetane number - Gaseous fuels - LPG, CNG - Combustion: Calorific value - higher and lower calorific values - Theoretical calculation of calorific value - Flue gas analysis (ORSAT Method).

TOTAL: 45 PERIODS

CHAIRMAN
BoS (S&H) 19/02/25

LIST OF THE EXPERIMENTS - CHEMISTRY LABORATORY

1. Estimation of HCl using Na_2CO_3 as primary standard and determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of Chloride content of water sample by Argentometric method.
4. Determination of strength of given hydrochloric acid using pH meter.
5. Estimation of Copper content by spectrophotometer.
6. Estimation of iron content of the given solution using potentiometer.
7. Conductometric titration of strong acid Vs strong base.

TOTAL: 30 PERIODS

OUTCOMES:
On successful completion of the course, the students will be able to,
- Understand the various water treatment methodologies and its applications.
- Recognize corrosion protection techniques and appropriate mitigation strategies.
- Assess different types of polymers, composites and their industrial applications.
- Illustrate the concept of phase diagram, working principles of batteries, emerging energy storage technologies and their applications.
- Analyze the various fuels and their properties.

TEXT BOOKS:
1. P. C. Jain and Monica Jain, "Engineering Chemistry", Dhanpat Rai Publishing, Company, New Delhi, 2015.
2. S. S. Dara, "A Text Book of Engineering Chemistry", ꞁ Chand & Cꞌ. Ltd., New Delhi, 2013.

REFERENCES:
1. Shika Agarwal, "Engineering Chemistry", Cambridge University Press, Delhi, 2016.
2. B. Sivashankar, "Engineering Chemistry", Tata Mc. Graw–Hill Publishing Company, Ltd., Delhi, 2012.
3. G Palanna, "Engineering Chemistry", Tata Mc. Graw Hill Education Private Limited, Delhi, 2017.
4. Prasanta Rath,"Engineering Chemistry", Cengage Learning India Pvt. Ltd., Delhi, 2018.

CHAIRMAN
BoS (S&H) 19/02/25

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS
CHEMISTRY LABORATORY

S.No.	Name of Equipment	Quantity Required
1	pH Meter	10 Nos.
2	Digital Conductivity Meter	10 Nos.
3	Digital Potentiometer	10 Nos.
4	Electronic Balance	5 Nos.
5	Deionizer unit	1 No.
6	Spectrophotometer	5 Nos.

CHAIRMAN
BoS (S&H) 19/02/25

Mapping of COs with POs

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

CHAIRMAN
BoS (S&H) 19/02/25

24GE102 **ENGINEERING GRAPHICS** L T P C
(Common to All Branches) 3 0 2 4

OBJECTIVES:
The student should be made to:

- Understand the various basic concepts like dimensioning, standards, curves and free hand sketching
- Develop the skills on projection of points, lines and plane surfaces
- Impart knowledge on projection of solids like prisms and pyramids
- Illustrate the section of solids and development of surfaces for various objects
- Acquire skills on viewing of solid objects in Isometric and Perspective projections

CONCEPTS AND CONVENTIONS (NOT FOR EXAMINATION) 2

Importance of graphics in engineering applications - Use of drafting instruments - BIS conventions and specifications - Size, layout and folding of drawing sheets - Lettering and geometric dimensioning

UNIT I PLANE CURVES AND FREE HAND SKETCHING 9+6

Curves used in engineering practices: Conics - Construction of ellipse, Parabola and hyperbola by eccentricity method - Construction of cycloid and involutes of square and circle- Drawing of tangents and normal to the above curves.

Visualization concepts and Free Hand sketching: Visualization principles - Representation of Three Dimensional objects - Layout of views – Free hand sketching of multiple views from pictorial views of objects.

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES 9+6

Projection of points - Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true length and true inclination by rotating line method - Projection of planes inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS 7+6

Projection of simple solids like prisms, pyramids, cylinder, cone when the axis is inclined to one of the principal planes by rotating object method.

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT 9+6
OF SURFACES

Sectioning of solids: prisms, pyramids, cylinder, cone in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other - obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids: prisms, pyramids, cylinder and cone.

CHAIRMAN
(BoS) MECH) 3 / 2

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 9+6

Principles of isometric projection - isometric scale - isometric projections of simple solids, truncated and frustum of solids: Prisms, pyramids, cylinder, cone - Perspective projection of simple solids: Prisms, pyramids and cylinder by visual ray method.

TOTAL: 75 (45+30) PERIODS

OUTCOMES:
On successful completion of this course, the students will be able to,
- Relate the engineering knowledge on dimensioning, standards, curves and free hand sketching objects
- Identify the various views on the projection of points, straight lines and plane surfaces
- Apply the knowledge on projection of solids like prisms and pyramids
- Analyze the section of solids and development of surfaces
- Develop the isometric views and perspective projection of simple solids

TEXT BOOKS:
1. Natarajan K V., "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2023.
2. Venugopal K and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2024.

REFERENCES:
1. Bhatt N D and Panchal V M., "Engineering Drawing", Charotar Publishing House, 50th Edition, 2023.
2. Basant Agarwal and Agarwal C M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2019.
3. Gopalakrishna K R., "Engineering Drawing" (Vol. I & II combined), Subhas Stores, Bangalore, 2017.

Special points applicable to End Semester Examinations on Engineering Graphics:
1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use an appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day.

Mapping of COs with POs

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

CHAIRMAN
(BoS / MECH)

24TA101   **HERITAGE OF TAMILS**   **L T P C**
                        (Common to All Branches)   **1 0 0 1**

OBJECTIVES:
The students should be made to:
- Learn the extensive literature of classical Tamil.
- Analyze rock art paintings to modern art.
- Understand folk and martial arts.
- Apply the concepts of Thinai in Tamils.
- Realize the contribution of Tamils in Indian freedom struggle.

UNIT I   LANGUAGE AND LITERATURE   3
Language Families in India - Dravidian Languages –Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.

UNIT II   HERITAGE-ROCK ART PAINTINGS TO MODERN ART–
**   SCULPTURE   3**
Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.

UNIT III   FOLK AND MARTIAL ARTS   3
Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

UNIT IV   THINAI CONCEPT OF TAMILS   3
Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature – Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.

UNIT V   CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT
**   AND INDIAN CULTURE   3**
Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India– Self-Respect Movement- Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.

TOTAL: 15 PERIODS

CHAIRMAN
BoS (S&H) 19/12/25

OUTCOMES:
On successful completion of the course, the students will be able to,
- Recognize the extensive literature Tamil and classical nature.
- Understand the heritage of sculpture, painting and musical instruments.
- Classify the folk and martial arts of Tamil people.
- Realization of Thinai concepts, trade and victory of Chozha dynasty.
- Interpret the contribution of Tamils in Indian freedom struggle, Self- esteem movement and siddha medicine.

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு - மக்களும் பண்பாடும் – கே. கே. பிள்ளை (வெளியீடு:தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் - முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி .. – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு).
4. பொருநை -ஆற்றங்கரை நாகரீகம். (தொல்லியல் துறை வெளியீடு).
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by:International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by : International Institute of Tamil Studies.)
9. Keeladi – 'Sangam City Civilization on the banks of the river Vaigai' (Jointly Published by: Department of Archaeology & Tamilnadu Textbook and Educational Services Corporation, Tamilnadu.)
10. Studies in the History of India with Special Reference to Tamilnadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamilnadu Textbook and Educational Services Corporation, Tamilnadu.)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

Mapping of COs with POs

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

CHAIRMAN
BoS (S&H) 19/02/25

24TA101   **தமிழர் மரபு**   **L T P C**
           (அனைத்து துறைகளுக்கும் பொதுவானது)   **1 0 0 1**

நோக்கங்கள்:

மாணவர்கள் கண்டிப்பாக அறிய வேண்டுவன:

- செம்மொழியான தமிழ் மொழியின் விரிவான இலக்கியத்தைப் பற்றி அறிதல்.
- பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை உள்ள கலைகளை பகுப்பாய்வு செய்தல்.
- நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகளைப் புரிந்துகொள்ளுதல்.
- தமிழர்களின் திணைக் கோட்பாடுகளைச் செயல்படுத்துதல்.
- இந்திய விடுதலைப் போராட்டத்திற்கும் பண்பாட்டிற்கும் தமிழர்களின் பங்களிப்பை உணருதல்

அலகு 1   மொழி மற்றும் இலக்கியம்   **3**

இந்திய மொழிக் குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி - தமிழ் செவ்விலக்கியங்கள் –சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை - சங்க இலக்கியத்தில் பகிர்தல் அறம்-திருக்குறளில் மேலாண்மைக் கருத்துக்கள்- தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம்- பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் - சிற்றிலக்கியங்கள் -தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி - தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

அலகு II   மரபு - பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக் கலை   **3**

நடுகல் முதல் நவீன சிற்பங்கள் வரை - ஐம்பொன் சிலைகள் - பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் - தேர் செய்யும் கலை - சுடுமண் சிற்பங்கள் - நாட்டுப்புறத் தெய்வங்கள் -குமரிமுனையில் திருவள்ளுவர் சிலை - இசைக்கருவிகள் - மிருதங்கம், பறை , வீணை , யாழ், நாதஸ்வரம் – தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

அலகு III   நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்   **3**

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

அலகு IV   தமிழர்களின் திணைக் கோட்பாடுகள்   **3**

தமிழகத்தின் தாவரங்களும், விலங்குகளும் - தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் - தமிழர்கள்

CHAIRMAN
BoS (S&H) 19/02/25

போற்றிய அறக்கோட்பாடு - சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் –சங்ககால நகரங்களும் துறை முகங்களும் -சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி - கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.

அலகு V இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு 3

இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில் சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.

TOTAL: 15 PERIODS

முடிவுகள்:

பாடத்தின் முடிவில், மாணவர்கள் அறிந்து கொள்வன:

- தமிழ் மொழியின் செம்மொழி தன்மையையும் சங்க இலக்கியத்தின் முக்கியத்துவத்தையும் உணர்வார்கள்.
- தமிழர்களின் சிற்ப, ஓவிய, இசை மரபுகளை புரிந்துகொள்வார்கள்.
- நாட்டுப்புறக் கலைகளையும் வீர விளையாட்டுகளையும் வகைப்படுத்துவார்கள்.
- தமிழர்களின் திணைக் கோட்பாடுகளும் சங்ககால வர்த்தகமும் புரிந்துகொள்வார்கள்.
- இந்திய விடுதலைப் போராட்டம், சுயமரியாதை இயக்கம், சித்த மருத்துவம் ஆகியவற்றில் தமிழர்களின் பங்களிப்பை விளக்குவார்கள்.

உரை மற்றும் குறிப்பு புத்தகங்கள்:

1. தமிழக வரலாறு - மக்களும் பண்பாடும் – கே. கே. பிள்ளை (வெளியீடு:தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் - முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை -ஆற்றங்கரை நாகரீகம். (தொல்லியல் துறை வெளியீடு).
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by:International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by : International Institute of Tamil Studies.)

CHAIRMAN
BoS (S&H) 19/12/25

9. Keeladi – 'Sangam City Civilization on the banks of the river Vaigai' (Jointly Published by: Department of Archaeology & Tamilnadu Textbook and Educational Services Corporation, Tamilnadu.)
10. Studies in the History of India with Special Reference to Tamilnadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamilnadu Textbook and Educational Services Corporation, Tamilnadu.)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

Mapping of COs with POs

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

CHAIRMAN
BoS (S&H) 19/02/25

24GE104L	ENGINEERING PRACTICES LABORATORY	L	T	P	C
	(Common to All Branches)	0	0	4	2

OBJECTIVES:

The student should be made to:

- Acquire knowledge in calculation of area and volume of various 2D and 3D shapes and gain practical exposure in pipeline connections and carpentry
- Develop the fundamental skills in welding, machining, sheet metal and foundry works
- Illustrate the basic working principles of air conditioner, industrial robot and washing machine
- Learn the domestic, industrial wiring circuits and measure the electrical parameters
- Demonstrate the basic electronic components in PCB, assemble of smart phone, computer and LED TV

GROUP A (CIVIL & MECHANICAL)

I. CIVIL ENGINEERING PRACTICES   15
Basic Measurements

1. Calculation of area and volume for various solid and hollow shapes, including cubical, spherical, cylindrical and conical models with different scale conversions.

Carpentry

2. Study of industrial trusses and joints in doors and windows using models.
3. Sawing and planing- Making joints: T-joint, Mortise joint, and Tenon joint.

Plumbing

4. Laying pipe connections for suction and delivery sides of the pumps and preparation of plumbing line sketches for water supply and sewage works.
5. Connecting various pipe fittings using different materials (metal, plastic, and flexible pipes) and other components which are commonly used in household appliances.

II. MECHANICAL ENGINEERING PRACTICES   15
Welding:
      a) Arc Welding
            i) Butt joint
            ii) Lap joint
      b) Gas welding practice

Basic Machining:
      a) Turning and Facing
      b) Drilling and tapping

Sheet Metal work:
      a) Making of a funnel
      b) Making of a tray

Foundry work:
      a) Making a mould using solid pattern
      b) Making a mould using split pattern

Study Experiments
      a) Study of components in Air conditioner
      b) Study of components in Industrial robot
      c) Study of components in Washing machine

CHAIRMAN
(BoS / EEE)

CHAIRMAN
(BoS / MECH)

GROUP B (ELECTRICAL AND ELECTRONICS)

III. ELECTRICAL ENGINEERING   15
1. Residential house wiring using switches, fuse, indicator, circuit breaker, lamp and Energy meter
2. Stair case wiring
3. Industrial wiring using switches, fuse, indicator and Energy meter
4. Measurement of electrical quantities - voltage, current, power, power factor and energy in RLC circuit
5. Calculation of energy consumption for different lamps
6. Study of fan with regulator, Iron Box and Emergency Lamp

IV. ELECTRONICS ENGINEERING   15
1. Study and identification of electronic components -Resistors, Capacitors and Inductors
2. Assembling and testing electronic components in small PCB
3. Assembling and dismantling of Computer/Laptop
4. Assembling and dismantling of LED TV
5. Study of elements in smart phone

TOTAL: 60 PERIODS

OUTCOMES:
On successful completion of this course, the students will be able to,

- Interpret engineering knowledge on calculation of area and volume of different geometric shapes, connecting various household fittings and making carpentry joints
- Apply engineering skills to do welding, machining, sheet metal and foundry works
- Gain knowledge on Air conditioner, Industrial robot and washing machine
- Understand the domestic, industrial wiring circuits and measure the various electrical parameters
- Analyze the basic components of electronic circuits, computer, laptop, smart phone and LED TV

Mapping of COs with POs

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

CHAIRMAN
(BoS / EEE)

CHAIRMAN
(BoS / MECH)

24GE104L   ENGINEERING PRACTICES LABORATORY

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

GROUP A (CIVIL & MECHANICAL)

S. No	Name of Equipment	Quantity Required

CIVIL ENGINEERING PRACTICES

Basic Measurements

1.	Sphere	03 Nos.
2.	Cylinder	03 Nos.
3.	Cone	03 Nos.
4.	Cube	03 Nos.
5.	Cuboid	03 Nos.

Carpentry

6.	Industrial truss	03 Nos.
7.	Door Joint	03 Nos.
8.	Window Joint	03 Nos.
9.	Try Square	15 Nos.
10.	Hand Saw	15 Nos.
11.	Carpentry bench vice	15 Nos.
12.	Firmer Chisel	15 Nos.
13.	Motrin Chisel	15 Nos.
14.	Iron Jack	15 Nos.
15.	Mallet	15 Nos.
16.	Bench hold fastens (C Clamp)	15 Nos.
17.	Wood Cutting Machine	2 Nos.
18.	Planer machine	2 Nos.
19.	Hand drilling Machine	2 Nos.
20.	Jig Saw	2 Nos.

Plumbing

21.	Pipe Vice	15 Nos.
22.	Die Holder with Die set	10 Nos.

CHAIRMAN
(BoS / MECH) 31/05

S. No	Name of Equipment	Quantity Required
	MECHANICAL ENGINEERING PRACTICES	

Welding

1.	Arc welding unit	5 Nos.
2.	Gas welding unit	2 Nos.

Basic Machining

3.	Lathe Machines	3 Nos.
4.	Drilling Machines	2 Nos.

Sheet Metal work

5.	Steel rule	5 Nos.
6.	Bend snips	5 Nos.
7.	Straight snips	5 Nos.
8.	Scriber	5 Nos.
9.	Divider	5 Nos.
10.	Trammel	5 Nos.
11.	Prick Punches	5 Nos.
12.	Centre punches	5 Nos.
13.	Pliers	5 Nos.
14.	Ball peen hammer	5 Nos.
15.	Cross peen hammer	5 Nos.
16.	Bull wart hammer	5 Nos.
17.	Mallet	5 Nos.
18.	Anvil	3 Nos.
19.	Swage block	3 Nos.
20.	Wire gauges	2 Nos.

Foundry work

21.	Cope and Drag Box	5 Nos.
22.	Solid pattern	5 Nos.
23.	Split pattern	5 Nos.
24.	Runner	5 Nos.
25.	Riser	5 Nos.
26.	Sprue pin	5 Nos.
27.	Sand rammer	5 Nos.
28.	Trowel	5 Nos.

Study Experiments

29.	Air-conditioner unit	1 No.
30.	Industrial Robot	1 No.
31.	Washing Machine	1 No.

CHAIRMAN
(BoS / MECH)

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

S. No.	Description of Equipment	Quantity Required (Nos)
Part III: Electrical Engineering		
1.	Single phase house wiring setup	5
2.	Three phase house wiring setup	3
3.	Staircase wiring setup	3
4.	Fluorescent lamp and LED with wiring setup	Each 3
5.	Emergency lamp wiring setup	2
6.	Iron box wiring setup	2
7.	Fan with Regulator	2
8.	AC Voltmeter, Ammeter, Wattmeter and Energy Meter	Each 4
9.	R-Load	4
10.	Inductive and Capacitive Load	Each 1
Part IV: Electronics Engineering		
1.	Soldering Iron, Lead	10 Set
2.	Multi meter	10
3.	Continuity tester	10
4.	Used Laptop	3
5.	Used desktop computer	3
6.	Used LED TV	3
7.	Used Smart Phone	3
8.	DC Regulated power supply (0-30V)	2
9.	Resistors	200
10.	Capacitors	200
11.	Diodes	100
12.	Transistors	50

CHAIRMAN
BoS(EEE) 26/02/25

24EEC101L INTERPERSONAL COMMUNICATION LABORATORY   L T P C
(Common to All Branches)   0 0 2 1

OBJECTIVES:
The students should be made to:
- Improve the communicative competence of learners
- Help learners use language effectively in academic/work contexts
- Develop various listening strategies to comprehend various types of audio materials like lectures, discussions, videos etc.
- Build on students' English language skills by engaging them in listening, speaking and grammar learning activities that are relevant to authentic contexts.
- Use language efficiently in expressing their opinions via various media.

UNIT I   INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION   6
Listening for general information-specific details - conversation: Introduction to classmates (formal & informal); Telephone conversation; Speaking - Self Introduction-Introducing a friend; - politeness strategies - making polite requests, making polite offers, replying to polite requests and offers - understanding basic instructions (filling out a bank application for example).

UNIT II   NARRATION AND SUMMATION   6
Listening - Listening to podcasts, anecdotes / stories / event narration; documentaries and interviews with celebrities. Speaking - Narrating personal experiences / events- Talking about current and temporary situations & permanent and regular situations - describing experiences and feelings engaging in small talk- describing requirements and abilities.

UNIT III   DESCRIPTION OF A PROCESS / PRODUCT   6
Listening - Listen to product and process descriptions, a classroom lecture; and advertisements about products. Speaking – Picture description- describing locations in workplaces- Giving instruction to use the product- explaining uses and purposes- Presenting a product- describing shapes and sizes and weights- talking about quantities(large & small)- talking about precautions.

UNIT IV   FUNCTIONAL COMMUNICATION   6
Listening – Listening to TED Talks; Listening to lectures - and educational videos. Speaking – Small Talk; discussing and making plans-talking about tasks-talking about progress- talking about positions and directions of movement-talking about travel preparations- talking about transportation.

UNIT V   PROFESSIONAL SKILLS   6
Listening – Listening to debates/ discussions; different viewpoints on an issue; and panel discussions. Speaking –making predictions- talking about a given topic.

TOTAL: 30 PERIODS

CHAIRMAN
BoS (S&H) 19/02/25

OUTCOMES:

On successful completion of the course, the students will be able to,
- Listen to and comprehend general as well as complex academic information.
- Listen to and understand different points of view in a discussion.
- Speak fluently and accurately in formal and informal communicative contexts.
- Describe products and processes and explain their uses and purposes clearly and accurately.
- Express their opinions effectively in both formal and informal discussions.

Mapping of COs with POs

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

CHAIRMAN
BoS (S&H) 19/02/25

LIST OF EQUIPMENTS
Requirements for a batch of 30 students

Sl. No.	Description of Equipment/Software	Quantity required (Nos)
1	Computer	30
2	Headphones	30
3	**Software:** Globarena	30

CHAIRMAN
BoS (S&H) 19/02/25

24EN201	TECHNICAL ENGLISH	L T P C
	(Common to All Branches)	3 0 0 3

OBJECTIVES:

The students should be made to:

- Improve understanding of commonly used English usage by cultivating listening skills through informal interactions.
- Enrich their speaking abilities through scenario-based conversations to understand how language functions in context.
- Develop their ability to read critically by analyzing newspaper articles.
- Use group discussion techniques to improve cooperative communication.
- Enhance your ability to write professionally by creating organized reports.

UNIT I   CONVERSATION   9

Listening: Listening to informal conversations, Speaking: Short conversations in varied situations in student life, Reading: Reading Short text and longer passages for comprehension at deeper levels, Writing: Writing reviews (book / film), Grammar: Compound Nouns - Numerical Expression, Vocabulary: Cause and Effect Expressions.

UNIT II   LANGUAGE IN USE   9

Listening: Listening to Situation based Dialogues, Speaking: Asking about Routine actions and giving directions, Reading: Reading a short story for appreciation and understanding, Writing: Writing Emails - Dialogue writing, Grammar: Purpose expressions - Adverbs, Vocabulary: Imperative sentences.

UNIT III   ENGLISH FOR SPECIFIC PURPOSE   9

Listening: Listening strategies for deeper understanding, Speaking: Using dictionary for learning pronunciation, stress and syllable divisions, Reading: an article from Newspaper - Critical reading, Writing: Note-Making / Note-Taking - Essay writing, Grammar: Definition, Degrees of Comparison, Vocabulary: Model verbs.

UNIT IV   ENGLISH FOR CAREER   9

Listening: Listening to the interviews of CEOs / entrepreneur, Speaking: Group Discussion skills, Reading: pre reading and post reading tasks, Writing - Job application - Cover letter & Resume, Grammar: Active and Passive voice, Relative Pronouns, Vocabulary: Synonyms and Antonyms.

UNIT V   REPORT WRITING   9

Listening: Listening and making notes, Speaking: Discussion on problems and solutions (case studies), Reading: Reading abstracts / Journal Articles, Writing: Minutes of meeting, Reports (Feasibility / Accident / Survey Report), Grammar: If Clause, Vocabulary: Idioms and their Meanings.

TOTAL: 45 PERIODS

CHAIRMAN
BoS(S&H) 19/02/25

OUTCOMES:
On successful completion of the course, the students will be able to,
- Respond to informal conversations with effectiveness, exhibiting understanding.
- Appreciate and critically engage with short stories, articulating insights.
- Utilize dictionaries to comprehend syllable structures and pronounce words correctly.
- Engage in healthy group discussions by answering peers' questions and sharing ideas.
- Acquire constructive criticism in case study by describing issues.

TEXT BOOKS:
1. Bhatnagar, Nitin and Bhatnagar, Mamta, "Communicative English for Engineering and Professionals", Pearson Education India, 2010.

REFERENCES:
1. Raman, Meenakshi and Sharma, Sangeetha, "Technical Communication Principles and Practice", Oxford University Press, Delhi, 2019.
2. Andrea J, Rutherford. "Basic Communication Skills for Technology", Pearson Education, Inc., 2013.
3. Rizvi M, Ashraf. "Effective Technical Communication", Tata McGraw Hill Education Pvt.Ltd., Delhi,2017.

Mapping of COs with POs

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

CHAIRMAN
BoS(S&H)

24MA203	VECTOR CALCULUS AND STATISTICS	L T P C
	(Common to Civil, Mech and AGE)	3 1 0 4

OBJECTIVES:
The Student should be made to:
- Grasp the fundamental ideas of vectors, vector fields, and scalar fields.
- Identify the field of engineering in ODE as an effective tool for resolving practical issues.
- Interpret the geometric implications of analytic functions in terms of conformal mapping.
- Differentiate knowledge of hypothesis testing to small and large samples that play an important role in real-life problems.
- Analyze differences among group means, while controlling the Type I error rate.

UNIT I   VECTOR CALCULUS   9+3
Gradient of a Scalar point function - Divergence, Curl, Solenoidal and irrotational of a vector point function - Directional Derivative - Green's, Gauss divergence and Stoke's theorems (without proof)

UNIT II   ORDINARY DIFFERENTIAL EQUATIONS   9+3
Higher order linear differential equations with constant coefficients $(e^{ax}V, x^{n}V)$ - Method of variation of parameters - Cauchy's linear differential equations - Legendre's linear differential equations

UNIT III   ANALYTIC FUNCTIONS   9+3
Functions of a complex variable - Analytic functions: Necessary condition - Cauchy-Riemann equations and sufficient condition (statement only) Harmonic and orthogonal properties of analytic function - Construction of analytic functions by Milne's method - Conformal mapping $(w = z + k, 1/z, kz)$ - Bilinear transformation.

UNIT IV   TESTING OF HYPOTHESIS   9+3
Statistical hypothesis - Large sample tests based on Normal distribution for single mean and difference of means - Small sample tests based on t distributions for testing of means and F distributions for testing of variances - Chi-square - Contingency table (test for Independency) - Goodness of fit.

UNIT V   ANALYSIS OF VARIANCE   9+3
One way classifications - two way classifications - Completely randomized design -Randomized block design - Latin square design

TOTAL: (45+15) PERIODS

CHAIRMAN
BoS (S&H)

OUTCOMES:

On successful completion of the course, the students will be able to,

- Understand the concepts of gradient, divergence, and curl in vector calculus.
- Apply suitable techniques for solving second and higher-order differential equations.
- Utilize conformal mapping and analytic functions to transform complex functions between different domains.
- Formulate the null and alternative hypotheses based on research questions and real-life scenarios.
- Classify the one-way and two-way ANOVA and interpret their applications in statistical analysis.

TEXT BOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2017.
2. Richard A. Johnson., "Probability and Statistics for Engineers", Pearson Education, 8th Edition, 2019.

REFERENCES:

1. Kreyszig Erwin, "Advanced Engineering Mathematics", John Wiley and Sons, 10th
2. Edition, New Delhi, 2018.
3. O'Neil, P.V. "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, 7th Edition New Delhi 2013.
4. Devore. J.L.,"Probability and Statistics for Engineering and the Sciences, Cengage Learning, New Delhi, 8th Edition, 2021.
5. Spiegel Schiller "Probability and Statistics" Tata McGraw-Hill Publishing Company Limited, New Delhi. 3rd Edition, 2018.

Mapping of COs with POs

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

CHAIRMAN
BoS (S&H) 19/02/25

24MC002 **UNIVERSAL HUMAN VALUES 2 - UNDERSTANDING HARMONY** **L T P C** **2 1 0 3**

(Common to All Branches)

OBJECTIVES:

The students should be made to:

- Demonstrate an understanding of ethical principles and human values
- Apply critical thinking to analyze ethical dilemmas and conflicts
- Communicate effectively about ethical issues and human values
- Appreciate the importance of harmony in personal, social, and environmental contexts
- Engage in practices that promote ethical behavior and societal harmony

UNIT 1   INTRODUCTION TO VALUE EDUCATION   6+3

Value Education – need and process, Self-Exploration – process, Basic Human Aspirations - Continuous Happiness and Prosperity, Basic requirement for fulfilment of Human Aspirants, Understanding Happiness and Prosperity – Continuity of Happiness from Physical Facility.

UNIT II   HARMONY IN THE HUMAN BEING   6+3

Human being as a co-existence of the self and the Body - The needs of Self and Body, Body as an Instrument - The Self as the Seer- Doer-Enjoyer, Harmony in the self, Harmony of the Self with the Body –Programme for Self – regulation and health.

UNIT III   HARMONY IN THE FAMILY AND SOCIETY   6+3

Family as the basic unit of human interaction , Understanding Relationship, Trust as the foundational value, Respect as the Right Evaluation, Harmony in the society – Understanding Human Goal, Harmony from Family Order to World Family Order – Universal Human Order - Scope.

UNIT IV   HARMONY IN THE NATURE AND EXISTENCE   6+3

Nature - as Collections of Units, Classification of Units into Four Orders, Interconnectedness, and mutual fulfilment among the four orders of nature, self-regulation in Nature, Understanding Existence as Units in Space, Existence as Co-existence.

UNIT V   IMPLICATIONS OF THE ABOVE HOLISTIC UNDERSTANDING OF HARMONY ON PROFESSIONAL ETHICS   6+3
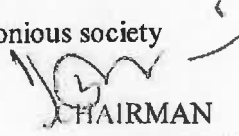
Natural Acceptance of Human Values - Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Constitution, Universal Human Order, Competence in Professional Ethics, Holistic Technologies, Production System and Management Models – Typical case, Strategies for Transition towards value based life and profession.

TOTAL: (30+15) PERIODS

OUTCOMES:

On successful completion of the course, the students will be able to,

- Understand the significance of value education and distinguish between values and skills
- Understand the concept of harmony within the self and how it relates to human values
- Analyze the role of family and society in fostering harmony
- Evaluate the relationship between human values and harmony in nature
- Develop skills to resolve conflicts and promote harmony in personal and professional life
- Reflect on ethical principles and their application in creating a harmonious society

CHAIRMAN

BoS (S&H)

TEXT BOOKS:
1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics, Excel Books, New Delhi, 2nd Revised Edition, 2019.

REFERENCES:
1. Tripathi A N, "Human Values", New Age Intl. Publishers, New Delhi, 2009.
2. Govindarajan M, Natrajan S and Senthilkumar V S, "Engineering Ethics (Including HumanValues)" Eastern Economy, PHI, 12th Edition, 2011.
3. Govindarajan M and Natrajan S, "Professional Ethics and Human Values", PHI, 2011.
4. Banerjee B P, "Foundation of Ethics and Management", Excel Publication, 2005.
5. Bajpai B L, "Indian Ethos and Modern Management", New Royal Book Co, Lucknow,Reprinted 2008.
6. Seebauer and Robert L Berry, "Fundamentals of Ethics for Scientist and Engineers", OxfordUniversity Press, 2000.

Mapping of COs with POs

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

CHAIRMAN
BoS (S&H) 19/02/15

| 24CY201 | ENVIRONMENTAL SCIENCES (Common to All Branches) | L T P C 3 0 0 3 |

OBJECTIVES:
The students should be made to:
- Understand the structure and function of different ecosystems and concepts of biodiversity.
- Recognize the causes and effects of environmental pollutants and disaster management.
- Explore the natural resources and their sustainability.
- Examine the principles of sustainable development and Green Chemistry.
- Analyze the impacts of population on environment and human health.

UNIT I   ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY   9
Definition, scope and importance of environment - concept of an ecosystem - structure and function of an ecosystem - ecological succession - food chain - food web - structure and function of the (a) forest ecosystem (b) desert ecosystem (c) aquatic ecosystem - (pond and ocean) - Biodiversity: Hot spots of biodiversity - threats to biodiversity - values of biodiversity - endangered and endemic species - conservation of biodiversity: In-situ and ex-situ conservation methods.

UNIT II   ENVIRONMENTAL POLLUTION AND NATURAL CALAMITIES   9
Definition - causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Marine pollution (d) Noise pollution (e) Nuclear hazards - solid waste and E-waste Management: role of an individual in prevention of pollution-disaster management: flood, earthquake, cyclone and landslides.

UNIT III   NATURAL RESOURCES   9
Forest resources: deforestation, mining, dam and their effects on forest and tribal people - Water resources: Use and over - utilization of surface and ground water - dams-benefits and problems - Food resources: World food problems - effects of modern agriculture - fertilizer - pesticide problems, water logging, salinity - Energy resources: renewable energy sources - Solar energy, Tidal energy, Wind energy sources. Land resource: land degradation, Soil erosion and desertification - role of an individual in conservation of natural resources.

UNIT IV SOCIAL ISSUES AND SUSTAINABILITY   9
Water conservation - rain water harvesting- resettlement and rehabilitation of people; its problems and concerns - environmental ethics - acid rain, ozone layer depletion - waste land reclamation - Air (Prevention and Control of Pollution) act - Water (Prevention and control of Pollution) act - Wildlife protection act – Forest conservation act. Sustainable development- Green Chemistry: Principles of green chemistry - Environmental Impact Assessment. Sustainable habitat: Green buildings, Green materials, Energy efficiency, Sustainable transportation.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT   9
Population growth, variation among nations - population explosion - family welfare programme - environment and human health - value education - HIV / AIDS - threatening of communicable diseases for human population and its prevention - women and child welfare - role of information technology in environment and human health.

TOTAL: 45 PERIODS

CHAIRMAN
BoS (S&H) 19/02/25

OUTCOMES:
On successful completion of the course, the students will be able to,
- Articulate the significance of ecosystems and biodiversity.
- Evaluate the preventive measures of pollution and calamities.
- Identify the strategies for the conservation of natural resources.
- Retrieve the measures of green chemistry to real-world scenarios.
- Evaluate the issues of overpopulation and communicable diseases on the environment.

TEXT BOOKS:
1. Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill, Delhi, 2nd Edition, 2018.
2. Gilbert M. Masters, "Introduction to Environmental Engineering and Science", Pearson Education Pvt., Ltd., 3rd Edition, 2016.

REFERENCES:
1. G. Tyler Miller, St. Andrews Preshyterian, "Introduction to Environmental Science", Cengage Learning India Pvt., Ltd., 2010.
2. Dharmendra S. Sengar, "Environmental Law", Prentice hall of India Pvt. Ltd, Delhi, 2007.

Mapping of COs with POs

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

CHAIRMAN
BoS (S&H) 19/02/25

24GE101 COMPUTER FUNDAMENTALS AND C PROGRAMMING

(Common to All Branches)

L	T	P	C
3	0	0	3

OBJECTIVES:

The Student should be made to:

- Learn the fundamentals of Computer and Programming.
- Understand the basics of C programming and decision making statements.
- Learn how to construct programs using array and pointer.
- Understand the concept of string and function.
- Study the concept of structure, union and files.

UNIT I FUNDAMENTALS OF COMPUTER AND PROGRAMMING 9

Computer System - Components of Computer Hardware - Data Representation - Number System and Conversion - Program Development Life Cycle - Algorithm - Control Structures - Flowchart – Pseudo code - Programming Paradigms.

UNIT II BASICS OF C PROGRAMMING 9

Overview of C - C Character Set - Identifiers and Keywords - Variable Declaration - Data types - Type Qualifiers and Type Modifiers - Structure of a C Program - Executing a C Program - Operators and Expressions - Decision-Making and Looping Statements.

UNIT III ARRAYS AND POINTERS 9

Introduction to Arrays - Types of Array - Pointers - void Pointer - Null Pointer - Arrays of Pointers - Pointer to a Pointer - Pointer to an Array - Pointer Arithmetic.
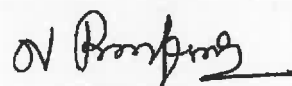
UNIT IV STRINGS AND FUNCTIONS 9

Strings - Reading String Input - String Library Functions - Command Line Arguments - Functions: Types - Declaration - Definition - Function Call - Pass by Value - Pass by Reference - Passing arrays to functions - Recursion.

UNIT V STRUCTURE, UNION AND FILES 9

Structures - Pointers to Structures - Array of Structures - Structures within a Structure - Functions and Structures - Unions - Storage Classes - Files: Streams - File type - File operations.

TOTAL: 45 PERIODS

CHAIRMAN
BoS (IT) 27/11

OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain the fundamentals of computer and programming.
- Choose appropriate data types, variables and statements for solving simple problems.
- Construct programs using arrays and pointers for a given scenario.
- Build programs using strings and functions in C language.
- Develop programs using structure, union and files for a given scenario.

TEXT BOOKS:

1. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Pearson India Education Services Pvt. Ltd., 2016.

REFERENCES:

1. Ajay Mital, "Programming in C - A Practical Approach", Pearson Education, 2015.
2. Dromey R G, "How to Solve it by Computer", Pearson Education, Fifteenth Impression, 2014.
3. Herbert Schildt, "C - The Complete Reference", Tata McGraw-Hill, 2013.
4. Ashok N Kamthane, "Computer Programming", Pearson Education, Second Edition, 2012.
5. Juneja B L and Anita Seth, "Programming in C", Cengage Learning India Pvt. Ltd., 2011.

Mapping of COs with POs:

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

CHAIRMAN
BoS (IT) 27/11

24CE201   **ENGINEERING MECHANICS**   L T P C
(Common to Civil and Mech)   3 1 0 4

OBJECTIVES:

The Students should be made to:

- Understand the basic concepts of statics of particles, forces and moments.
- Evaluate the various forces involved in rigid bodies.
- Solve problems related to first and second moment of area of different sections.
- Develop knowledge to analyze the various frictional forces.
- Analyze different types of dynamics and kinematics motion in particles.

UNIT I STATICS OF PARTICLES   12   (9+3)

Introduction - Units and dimensions - Laws of mechanics - Lami's theorem, Parallelogram and triangular law of forces - Vectorial representation of forces and moments - Coplanar forces - Resolution and composition of forces -Free body diagram - Equilibrium of a particle - Forces in space - Equilibrium of a particle in space - Equivalent systems of forces - Principle of transmissibility.

UNIT II STATICS OF RIGID BODIES   12   (9+3)

Moment of a force about a point and about an axis - Vectorial representation of moments and couples - Scalar components of a moment - Varignon's theorem -Types of supports and their reactions - Moments and couples - Equilibrium of rigid bodies in two dimensions.

UNIT III PROPERTIES OF SURFACES AND MASS   12   (9+3)

First moment of area, centroid of sections –Simple, Compound sections and Hollow sections- Second moment of plane areas – Simple, compound sections and Hollow sections - Parallel axis theorem and perpendicular axis theorem – Polar moment of Inertia – Product of Inertia – Introduction to mass moment of inertia of plane area.

UNIT IV KINETICS AND KINEMATICS   12   (9+3)

Frictional force - Laws of coulomb friction –Sliding friction - Static and Kinetic friction - Belt friction - Ladder friction- Wedge friction-Rolling resistance- Displacement, velocity and relative motion.

CHAIRMAN
BoS(Civil) 22/02/25

UNIT V DYNAMICS OF PARTICLES & KINEMATICS OF

RIGID BODIES   12 (9+3)

Rectilinear motion - Curvilinear motion - Newton's law- D'Alembert's Principle - Work energy equation of particles - Impulse and momentum –Impact of elastic bodies -Translation and rotation of rigid Bodies - General plane motion of simple rigid bodies such as cylinder and sphere.

TOTAL: 60 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to:

- Illustrate vectorial representation of forces and moments.
- Evaluate statics of rigid bodies in equilibrium.
- Analyze various properties of surfaces and masses.
- Determine various frictional forces applying laws of friction.
- Solve dynamic forces, kinematics of rigid bodies and its effects.

TEXT BOOKS:

1. Kottiswaran N, "Engineering Mechanics – Statics & Dynamics", Sri Balaji Publications11[th] Edition, 2017
2. Palanichamy, M.S., Nagan S., "Engineering Mechanics - Statics & Dynamics", Tata McGraw- Hill, 3rd Edition, 2006.

REFERENCE BOOKS:

1. Parthasarathi NS and Vela Murali, "Engineering Mechanics", Oxford University Press, 2016.
2. Irving H. Shames and Krishna Mohana Rao. G., "Engineering Mechanics - Statics and Dynamics", 4th Edition, Pearson Education,2006.
3. Meriam J.L. and Kraige L.G., "Engineering Mechanics" - Statics-Volume 1, Dynamics-Volume Third Edition, John Wiley & Sons, 9th Edition, 2018.
4. Beer, Jhonston, Cornwell and Sanghi, "Vector mechanics for engineers: statics and dynamics", Twelfth Edition, McGraw Hill Education,2019

CHAIRMAN
BoS(Civil)

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS(Civil) 22/02/25

| 24TA201 | TAMILS AND TECHNOLOGY | LTPC |
| | (Common to All Branches) | 1 0 0 1 |

OBJECTIVES:
Students should be made to:
- Gain knowledge about weaving and ceramic Technology
- Creating a design and construction Technology
- Analyzing manufacturing Technology
- Applying agriculture and irrigation Technology
- Remembering scientific and scientific Tamil and Tamil computing

UNIT I   WEAVING AND CERAMIC TECHNOLOGY   3
Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.

UNIT II   DESIGN AND CONSTRUCTION TECHNOLOGY   3
Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo -Saracenic architecture at Madras during British Period.

UNIT III   MANUFACTURING TECHNOLOGY   3
Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and gold- Coins as source of history - Minting of Coins – Beads making-industries Stone beads - Glass beads - Terracotta beads -Sheil beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram.

UNIT IV   AGRICULTURE AND IRRIGATION TECHNOLOGY   3
Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing Knowledge of Sea - Fisheries– Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.

UNIT V   SCIENTIFIC TAMIL & TAMIL COMPUTING   3
Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.

TOTAL: 15 PERIODS

OUTCOMES:
On successful completion of the course, the students will be able to,
- Understand weaving under ceramic Technology.
- Develop new design and construction Technology.
- Identify the manufacturing Technology.
- Understand agriculture and irrigation.
- Knowledge of scientific Tamil and Tamil computing.

CHAIRMAN
BoS (S&H) 19/02/25

TEXT-CUM-REFERENCE BOOKS

1. தமிழகவரலாறு - மக்களும்பண்பாடும் – கே. கே. பிள்ளை– (வெளியீடு:தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் - முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை -ஆற்றங்கரை நாகரீகம். (தொல்லியல் துறை வெளியீடு).
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by:International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by : International Institute of Tamil Studies.)
9. Keeladi – 'Sangam City Civilization on the banks of the river Vaigai' (Jointly Published by: Department of Archaeology & Tamilnadu Textbook and Educational Services Corporation, Tamilnadu.)
10. Studies in the History of India with Special Reference to Tamilnadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamilnadu Textbook and Educational Services Corporation, Tamilnadu.)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

Mapping of COs with POs

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

CHAIRMAN
BoS (S&H) 19/02/25

நோக்கம்:

மாணவர்கள் கண்டிப்பாக அறிய வேண்டுவன:

- நெசவு மற்றும் பீங்கான் தொழில்நுட்பம் பற்றிய அறிவைப் பெறுதல்.
- வடிவமைப்பு மற்றும் கட்டுமான தொழில் நுட்பத்தை உருவாக்குதல்.
- உற்பத்தி தொழில் நுட்பத்தை பகுப்பாய்வு செய்தல்.
- விவசாயம் மற்றும் நீர்ப்பாசனத் தொழில் நுட்பத்தைப் பயன்படுத்துதல்.
- அறிவியல் மற்றும் அறிவியல் தமிழ் மற்றும் தமிழ் கணிப்பொறி தொடர்பான அறிவை நினைவில் கொள்ளுதல்.

அலகு 1 நெசவு மற்றும் பானை தொழில் நுட்பம்   3

சங்க காலத்தில் நெசவுத்தொழில் - பானை தொழில் நுட்பம் - கருப்பு, சிவப்பு பாண்டங்கள் - பாண்டுகளில் கீறல் குறியீடுகள்.

அலகு 2 வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம் 3

சங்ககாலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் &சங்ககாலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு - சங்க காலத்தில் கட்டுமான பொருட்களும் நடுக்கல்லும் - சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்களும், கோவில்களும் - சோழர் காலத்து பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் நாயக்கர் கால கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டிநாட்டு வீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ - சாரோசெனிக் கட்டிடக்கலை.

அலகு 3 உற்பத்தித் தொழில்நுட்பம்   3

கப்பல் கட்டும் கலை - உலோகவியல் - இரும்பு தொழிற்சாலை - இரும்பை உருக்குதல், எஃகு - வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் - நாணயங்கள் அச்சடிகள் - மணி உருவாக்கும் தொழிற்சாலைகள் - கல்மணிகள், கண்ணாடி மணிகள் - சுடுமண் மணிகள் - சங்கு மணிகள் - எலும்பு துண்டுகள் - தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

அலகு 4 வேளாண்மை மற்றும் நீர்ப்பாசன தொழில்நுட்பம் 3

அணை, குளங்கள், மதகு - சோழர்கால குமுளி தூம்பின் முக்கியத்துவம் - கால்நடை பராமரிப்பு - கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் - வேளாண்மை மற்றும் வேளாண்மை சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மீன்வளம் - முத்து மற்றும் முத்து குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம்.

CHAIRMAN
BoS (S&H) 19/02/25

அலகு 5 அறிவியல் தமிழ் மற்றும் கணித்தமிழ்

அறிவியல் தமிழின் வளர்ச்சி - கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக் கல்விக் கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத் திட்டம்.

TOTAL: 15 PERIODS

முடிவுகள்:

பாடத்தின் முடிவில், மாணவர்கள் அறிந்து கொள்வன:

- பீங்கான் மற்றும் நெசவு தொழில்நுட்பத்தைப் புரிந்து கொள்ளுதல்.
- புதிய வடிவமைப்பு மற்றும் கட்டுமான தொழில் நுட்பத்தை உருவாக்குதல்.
- உற்பத்தித் தொழில் நுட்பத்தை அடையாளம் காணுதல்.
- விவசாயம் மற்றும் நீர்ப்பாசனத்தைப் புரிந்து கொள்ளுதல்.
- அறிவியல் தமிழ் மற்றும் தமிழ் கணிப்பொறி தொடர்பான அறிவை பெறுதல்.

உரை மற்றும் குறிப்பு புத்தகங்கள்:

1. தமிழகவரலாறு - மக்களும்பண்பாடும் – கே. கே. பிள்ளை– (வெளியீடு : தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் - முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை -ஆற்றங்கரை நாகரீகம். (தொல்லியல் துறை வெளியீடு).
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by:International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by : International Institute of Tamil Studies.)
9. Keeladi – 'Sangam City Civilization on the banks of the river Vaigai' (Jointly Published by: Department of Archaeology & Tamilnadu Textbook and Educational Services Corporation, Tamilnadu.)
10. Studies in the History of India with Special Reference to Tamilnadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamilnadu Textbook and Educational Services Corporation, Tamilnadu.)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

CHAIRMAN
BoS (S&H) 19/02/25

Mapping of COs with POs

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

CHAIRMAN
BoS (S&H) 19/12/25

24GE103L	C PROGRAMMING LABORATORY	L	T	P	C
	(Common to All Branches)	0	0	3	1.5

OBJECTIVES:

The Student should be made to:

- Learn how to develop C programs using conditional and looping statements
- Understand the concept of functions, arrays and strings
- Learn how to access memory using pointers
- Group different kinds of data related to a single entity
- Understand the manipulation of data in permanent storage

LIST OF EXPERIMENTS:

1. Programs using decision making statements.
2. Programs using looping statements.
3. Programs using user defined functions and recursive functions.
4. Programs using one dimensional and two dimensional arrays.
5. Solving problems using string functions.
6. Programs using pointers and dynamic memory allocation.
7. Programs using structures and unions.
8. Programs using pointers to structures and other data types.
9. Programs using text files.
10. Programs using binary files.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Implement C programs using control statements.
- Write C programs using functions, arrays and strings.
- Write C programs to access data in memory using pointers.
- Develop C programs using structures and other user defined data structures to manipulate heterogeneous data.
- Build C programs to manipulate data stored on permanent storage.

List of Equipment for a Batch of 30 Students:

- Standalone desktops with C compiler or Server with C compiler for 30 Nos.

Mapping of COs with POs :

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

CHAIRMAN
BoS (IT) 27/11

24CE202L	BUILDING DRAFTING AND MODELING LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

The students should be made to:

- Understand the software skills necessary for creating drafts and models of diverse buildings and intricate joinery details
- Analyze RCC isolated footing and stepped footing
- Evaluate plan, elevation and sectional views of industrial buildings
- Explain drafting plan, elevation and sectional views of residential buildings
- Create sectional views of various staircases

LIST OF EXPERIMENTS

1. Introduction to building bylaws - Symbols and sign conventions - Components of a typical residential building with load bearing walls – Developing plan, section and elevation of buildings.
2. Principles of planning, orientation and complete joinery details (Panelled and Glazed doors and windows) buildings with sloping roof, steel truss.
3. R.C.C. framed structures with stepped wall footing and isolated RCC Column footing.
4. Industrial buildings - North light roof structures.
5. Single storied residential building.
6. Staircase – Doglegged and open well stairs

TOTAL: 30 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to:

- Develop 2D and 3D views of buildings and joinery details
- Model different views of RCC isolated footing and stepped footing
- Sketch the North light roof structures of industrial buildings.
- Draw plan, section and elevation of residential building.
- Analyze the doglegged and open well stairs.

CHAIRMAN
BoS (Civil) 22 /02/25

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (Civil)

24CE202L	BUILDING DRAFTING AND MODELING LABORATORY	L	T	P	C
		0	0	3	1.5

LIST OF EQUIPMENTS

Requirements for a batch of 30 students

S. No.	Description of Equipment/Software	Quantity required
1	Computer System with necessary accessories	30 Nos
2	Licensed Software (AUTOCAD) for drafting	30 Licenses
3	Printer	01 No

CHAIRMAN
BoS (Civil) 22/02/25

24EEC201L   PROFESSIONAL COMMUNICATION LABORATORY   L T P C
(Common to All Branches)   **0 0 2 1**

OBJECTIVES:
The students should be made to:
- Establish effective time management techniques and professional grooming routines.
- Make progress on their own presentations by utilizing visual aids and interacting with the audience.
- Obtain the ability to participate in group conversations effectively and comprehend group dynamics.
- Recognize the protocol required for different types of interviews.
- Develop strategies for stress management, time management, and professional networking.

UNIT I   SOFT SKILLS DEVELOPMENT   6
Introduction to Soft Skills - Hard skills & soft skills - Employability and Career Skills - Grooming as a professional with values - Time Management - General awareness of Current Affairs.

UNIT II   DEVELOPING SELF ESTEEM   6
Self-Introduction-organizing the material - Introducing oneself to the audience - introducing the topic - answering questions - individual presentation practice - presenting the visuals effectively - Five minutes presentation

UNIT III   PROFESSIONAL SKILLS   6
Introduction to Group Discussion - Participating in group discussions - understanding group dynamics - brainstorming the topic - questioning and clarifying - GD strategies - activities to improve GD skills

UNIT IV   COMMUNICATION ETIQUETTES   6
Interview etiquette - dress code - body language - attending job interviews - telephonic interview - one to one interview & panel interview - FAQs related to job interviews

UNIT V   MANAGEMENT SKILLS   6
Recognizing the differences between groups and teams - managing time - managing stress-networking professionally- respecting social protocols - understanding career management-developing a long- term career plan-making career changes.

TOTAL: 30 PERIODS

OUTCOMES:
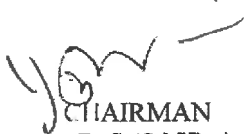**On successful completion of the course, the students will be able to,**
- Develop employability skills such as communication, teamwork, adaptability, and problem-solving.
- Enhance confidence and competence in answering questions effectively during presentations and discussions.
- Apply group discussion techniques and real-world exercises to improve debating abilities.
- Prepare for various job interviews, including panel, one-on-one, and telephone interviews.
- Formulate a comprehensive career plan, focusing on networking and career progression.

CHAIRMAN
BoS (S&H) 19/02/25

Mapping of COs with POs

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

CHAIRMAN
BoS (S&H) 19/02/25

LIST OF EQUIPMENTS
Requirements for a batch of 30 students

Sl. No.	Description of Equipment/Software	Quantity required (Nos)
1	Computer	30
2	Headphones	30
3	**Software:** Globarena	30

CHAIRMAN
BoS (S&H) 19/02/25

24MA303 TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS   L T P C
(Common to BME, CIVIL, EEE, ECE and MECH)   3 1 0 4

OBJECTIVES:
The Student should be made to:
- Understand the basic concepts of PDE for solving standard partial differential equations
- Remember the concepts of fourier series for solving problems in engineering disciplines
- Applying the standard techniques for solving boundary value problem
- Analyze Fourier transform techniques used in wide variety of situations
- Evaluate the Z transform techniques for discrete time systems

UNIT I   PARTIAL DIFFERENTIAL EQUATIONS   9+3
Formation of partial differential equations(single functions only) - Singular integrals -Solutions of standard types of first order partial differential equations(four types) - Lagrange's linear equation - Linear partial differential equations of second order with constant coefficients of homogeneous Equations.

UNIT II   FOURIER SERIES   9+3
Dirichlet's conditions - General Fourier series - Odd and even functions - Half range sine series - Half range cosine series - Complex form of Fourier series - Parseval's identity - Harmonic analysis.

UNIT III   FOURIER TRANSFORMS   9+3
Fourier transform pair - Fourier sine and cosine transforms - Properties - Transforms of simple functions - Convolution theorem - Parseval's identity.

UNIT IV   APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS   9+3
Classification of PDE - Method of separation of variables - Fourier Series Solutions of one dimensional wave equation - One dimensional equation of heat conduction - Steady state solution of two dimensional equation of heat conduction.

UNIT V   Z -TRANSFORMS AND DIFFERENCE EQUATIONS   9+3
Z-transforms - Elementary properties - Inverse Z-transform - Partial fraction - Convolution theorem (Statement and Examples) - Initial and final value theorems - Formation of difference equations - Solution of difference equations using Z-transform.

TOTAL: (45+15) PERIODS

OUTCOMES:
On successful completion of the course, the students will be able to,
- Understand suitable concepts in solving first order and second order partial differential equations with constant coefficients
- Identify the Fourier series for standard periodic waveforms
- Apply the solutions of wave and heat equations using Fourier series
- Analyze the properties and techniques of Fourier transforms
- Evaluate the necessary Z transform techniques to solve the difference equations

CHAIRMAN
BoS (S&H) 4/10

TEXT BOOKS:
1. Veerarajan T., "Transforms and Partial Differential Equations", 3rd Edition, Second reprint, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2017.
2. Grewal B.S., "Higher Engineering Mathematics", 43rd Edition, Khanna Publishers, Delhi, 2017.

REFERENCES:

1. Bali N.P and Manish Goyal, "A Text Book of Engineering Mathematics", Laxmi Publications(P) Ltd., 9th Edition, 2016.
2. Ramana B V, "Higher Engineering Mathematics", New Delhi Tata McGraw- Hill Education India Private Limited., 2018.
3. Glyn James, "Advanced Modern Engineering Mathematics", 4th Edition, Pearson Education, 2011.
4. Kreyszig Erwin, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2011.

Mapping of COs with POs

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

CHAIRMAN
BoS (S&H)

24CE301   **STRENGTH OF MATERIALS - I**   **L   T   P   C**

                                                          3   0   0   3

OBJECTIVES:

The Students should be made to:

- **Relate** the state of stress and strain in structural components for different loading conditions.
- **Illustrate** the concept of shear force and bending moment for statically determinate beams.
- **Compute** internal stress induced in beams of various cross sections.
- **Interpret** elements under complex state of stress and strain by analytical and graphical methods.
- **Analyze** the behavior of members subjected to pure torsion and shear in shaft and deformation in springs.

UNIT I   SIMPLE STRESSES AND STRAIN   9

Introduction - Normal stress and strain - Hooke's law - Poisson's ratio - Shear stress and strain - Mechanical properties of materials - Elasticity, plasticity and creep - Deformation of axially loaded member - Elastic constants - Thermal stresses and composite bars.

UNIT II   SHEAR FORCE AND BENDING MOMENT   9

Introduction - Types of beams - loads and reactions - concept of shearing force and bending moment - Shear force and bending moment for statically determinate beams - Shear force and bending moment diagrams.

UNIT III   BENDING AND SHEAR STRESS   9

Introduction - Pure bending and non - uniform bending - Assumptions - Section modulus - Normal stresses in beams - Flitched beams - Bending stress in beams - Shear stresses in beams of rectangular, circular, T and I section - Built-up beams.

UNIT IV   PRINCIPAL PLANE AND MOHR'S CIRCLE   9

Principal stresses and principal planes - Maximum shear stress - Plane strain - State of stress in two dimensions - Stress tensor at a point - Stress invariants - Stresses on inclined planes - Applications of plane stress - Mohr's circle method.

CHAIRMAN
BoS (CIVIL)

Theory of torsion - Stresses and deformations in solid and hollow circular shafts - Combined bending moment and torsion of shafts - Power transmitted to shaft - Shaft in series and parallel - Closed and open coiled helical springs - Laminated springs.

TOTAL: 45 PERIODS

OUTCOMES:

On Successful completion of this course, the students will be able to,

- **Interpret** mechanical properties of materials in structural components under stress and strain
- **Illustrate** shear force and bending moment diagrams for determinate beams
- **Solve** the flexural and shear stresses in various beams
- **Identify** principal stress and strain subjected to 2D elements analytically and graphically
- **Analyse** the torsional shear stress in shafts and deformation in springs

TEXT BOOKS:

1. Bansal. R.K, "Strength of Materials", Laxmi Publications Pvt. Ltd., New Delhi, 7th Edition, 2024.

2. Rajput.R.K, "Strength of Materials", S.Chand and Co, New Delhi, 7th Edition, 2022.

REFERENCES:

1. Punmia.B.C, Ashok Kumar Jain and Arun Kumar Jain, SMTS - I "Strength of Materials", Laxmi publications, New Delhi,10th Edition, 2024.

2. Singh. D.K, "Strength of Materials", Ane Books Pvt. Ltd., New Delhi, 4th Edition, 2020.

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

OBJECTIVES:

The students should be made to:

- **Recognize** the basic properties and behaviour of fluid under static conditions.
- **Explain** the fundamental knowledge of fluid kinematics and fluid dynamics.
- **Interpret** the incompressible viscous flow properties and losses through pipes.
- **Compute** the performance of prototypes through model studies.
- **Categorize** the significance of boundary layer theory and its applications.

UNIT I   FLUID PROPERTIES AND STATICS   9

Scope of Fluid mechanics - Fluid definition - properties of fluids - density, specific weight, specific volume, specific gravity, viscosity, compressibility, vapour pressure, capillarity and surface tension - fluid statics - pressure measurements by manometers - hydrostatic pressure on plane and curved surfaces - buoyancy and flotation - Stability of floating bodies.

UNIT II   FLUID KINEMATICS AND DYNAMICS   9

Fluid Kinematics - classification and types of flow - velocity potential function and stream function - flow net - continuity equation, derivation and applications to one dimensional flow - one and three dimensional differential forms - Fluid dynamics - equations of motion derivation of Euler's equation and Bernoulli's energy equation - Applications to velocity and discharge measurements - venturi meter - orifice meter and Pitot tube.

UNIT III   INCOMPRESSIBLE VISCOUS FLOW   9

Reynold's experiment - laminar flow through circular pipe - hagen poiseulle's - laminar flow between parallel plates - hydraulic and energy gradient - flow through pipes - darcy weisbach's equation - pipe roughness - friction factor - moody's diagram - major and minor losses of flow in pipes - pipes in series and in parallel.

CHAIRMAN
BoS (CIVIL)

UNIT IV   DIMENSIONAL ANALYSIS AND MODEL STUDIES   9

Fundamental dimensions - Dimensional homogeneity - Rayleigh's method and Buckingham π - theorem - reynolds, froude and mach number and their applications in model testing - Dimensionless parameters - Similitudes and model studies - distorted and undistorted models.

UNIT V   BOUNDARY LAYER   9

Boundary layer - definition - boundary layer on a flat plate - laminar and turbulent boundary layer - Displacement - Energy and Momentum thickness - momentum integral equation - boundary layer separation and control - drag and lift force on flat plate.

TOTAL: 45 PERIODS

OUTCOMES:

On Successful completion of this course, the students will be able to,

- **Relate** the various properties and characteristics of fluids to calculate stability of floating bodies.
- **Infer** the engineering principles of conservation laws applicable in fluid kinematics and dynamics.
- **Apply** engineering practice for incompressible viscous flow through pipes.
- **Build** skills in dimensional analysis and model studies to solve complex fluid problems.
- **Analyze** the boundary layer, drag and lift force in various applications of civil projects

TEXT BOOKS:

1. Modi P.N and Seth S.M, "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House, New Delhi, 23rd Edition, 2022.

2. Bansal.R.K, "Fluid Mechanics and Hydraulic Machines", Laxmi Publications Pvt Ltd., New Delhi,10th Edition, 2019.

CHAIRMAN
BoS (CIVIL)

REFERENCES:

1. Victor L. Streeter, Benjamin E. Wylie and Bedford K.W, "Fluid Mechanics", Tata McGraw-Hill, India, 9th Edition, 2017.

2. Subramanya.K, "Fluid Mechanics and Hydraulic Machines", Tata McGraw Hill Education Private Limited, New Delhi, 2nd Edition, 2018.

3. Jain.A.K, "Fluid Mechanics" (Including Hydraulic Machines), Khanna Publishers, 12th Edition,2016.

4. Rajput.R.K, "Fluid Mechanics", S.Chand and Co, New Delhi, 6th Edition, 2016.

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

24CE303   **SURVEYING**   L T P C

(Common to Civil and AGE)   3 0 0 3

OBJECTIVES:

The students should be made to:

- **Recognize** basic engineering knowledge about principles and fundamentals of surveying.

- **Explain** various methods in levelling and theodolite surveying for field construction.

- **Manipulate** skills using tacheometric surveying and triangulation.

- **Demonstrate** principles, calculations for azimuth in astronomical surveying.

- **Analyze** different types of advanced surveying techniques for various civil engineering projects.

UNIT I   FUNDAMENTALS OF SURVEYING   9

Definition - Principles - Classification - Scales - Survey instruments, their care and adjustment - Ranging and chaining - Reciprocal ranging - Compass Surveying - Bearing - Systems and conversions - Local attraction - True and magnetic meridians - Magnetic declination - Dip - Plane table and its accessories - Merits and Demerits - Radiation - Intersection - Resection - Plane table traversing.

UNIT II   LEVELLING AND THEODOLITE SURVEYING   9

Datum - Benchmarks - Levels - Temporary and permanent adjustments - Methods of Levelling - Fly and check levelling - contouring - Characteristics of contours - Methods of contouring -Theodolite - description and uses - temporary and permanent adjustments - horizontal - vertical angles - heights and distances - traversing - closing error and distribution.

UNIT III   TACHEOMETRIC SURVEYING AND TRIANGULATION   9

Tacheometry - principle - tangential - stadia methods - horizontal and inclined sights - staff -vertical and normal - fixed and movable hairs - stadia constants - anallatic lens - Gale's table - Triangulation - classification - Signals and towers - Baseline measurement - Instruments and accessories - Tape corrections - extension of baseline - Satellite stations - Reduction to centre.

CHAIRMAN
BoS (CIVIL)

UNIT IV ASTRONOMICAL SURVEYING 9

Celestial sphere - Astronomical terms and definitions - Motion of sun and stars - Apparent altitude and corrections - Celestial co-ordinate systems - Spherical trigonometry - Latitude and longitude of a place - Field observations and calculations for azimuth.

UNIT V OVERVIEW OF MODERN SURVEYING 9

EDM - Total Station Working Principles - Advantages - Fundamental quantities measured - Parts and accessories - GPS - Accessories - Advantages and Disadvantages - Different segments - space, control and user segments

TOTAL: 45 PERIODS

OUTCOMES:

On Successful completion of this course, the students will be able to,
- **Outline** the accessories, methods employed in fundamental surveying
- **Illustrate** elevation, horizontal and vertical angles using dumpy level and theodolite instruments
- **Develop** bearing, distances, height required in construction sites using tacheometric constants
- **Experiment** with apparent altitude, latitude, longitude, field observation using astronomical surveying
- **Examine** applications of modern instruments in construction field for various infrastructure projects.

TEXTBOOKS:

1. Punmia.B.C, Ashok K.Jain and Arun K.Jain, "Surveying Vol.I. and II", Lakshmi Publications Pvt Ltd, New Delhi, 17th Edition , 2016.
2. Kanetkar.T.P and Kulkarni.S.V, "Surveying and Levelling", Parts 1 & 2, Pune Vidyarthi Griha Prakashan, Pune, 2019

CHAIRMAN
BoS (CIVIL)

REFERENCES:

1. Arora K.R., "Surveying Vol I , II and III", Standard Book house, 17th Edition 2019.

2. Satheesh Gopi, Sathishkumar R, Madhu N, "Advanced Surveying, Total Station, GPS and Remote Sensing", Pearson education, 2nd Edition, 2017.

3. Roy S.K "Fundamentals of Surveying", Prentice Hall of India, 2011.

4. Ramamrutham S, "Plane and Geodetic Surveying", Dhanpat Rai, Publishing Company, New Delhi, 2nd Edition, 2016

MAPPING OF COs WITH POs

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

CHAIRMAN
BoS (CIVIL)

24CE304	CONSTRUCTION MATERIALS AND	L	T	P	C
	TECHNOLOGY	3	0	0	3

OBJECTIVES:

The students should be made to:

- **Recognize** the properties of basic construction materials.

- **Understand** the properties of lime, cement, ceramic, aluminum and other composite materials used in construction.

- **Interpret** various types of commercially available miscellaneous materials.

- **Manipulate** specifications and principles of concrete mix design.

- **Categorize** the properties of fresh and hardened concrete.

UNIT I   ROCKS, STONES, BRICKS AND AGGREGATES   9

Rocks - Stones - Classification - Composition - Characteristics of good stone - Physical tests - Stone veneering - Bricks - Manufacturing process, classification and testing as per IS Codal provisions - Qualities of good brick - Defects of bricks - Aggregates - Properties and test.

UNIT II   LIME, CEMENT AND OTHER MATERIALS   9
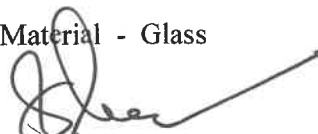
Lime - Preparation of lime mortar - Types of lime - Cement - Cement properties - Manufacturing process of cement - Tests - False ceiling materials - Aluminum - Uses - Ceramics - Refractories - Composite Materials - Types and applications.

UNIT III   MISCELLANEOUS MATERIALS   9

Paints and Varnishes, Polymers and Plastics - Timber - Market Forms - Physical Properties - Seasoning and Preservative Treatment - Cross section of exogenous tree - Ferrous Metals - Iron and Steel - Market Forms - Structural Steel - Mechanical treatment - Composition - Materials Properties and Behaviour - Non Ferrous Material - Glass Products - Properties - Applications.

CHAIRMAN
BoS (CIVIL)

UNIT IV   CONCRETE MIX PROPORTIONS   9

Specifications - Process of mix selection - Mean strength and minimum strength - Quality control - Factors governing the selection of mix proportions - Principle of concrete mix design - Mix selection of high performance and light weight aggregate concrete - BIS method of mix design - IS10262:2009.

UNIT V   PROPERTIES OF FRESH AND HARDENED CONCRETE   9

Ready mix concrete - Fresh concrete - Workability - Hardened concrete - Test - Strength - Segregation and bleeding - Ferro cement - Special concrete - High Strength Concrete - Light weight concrete.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- **Outline** different types of rocks, stones, bricks, and aggregates used for various construction works.

- **Classify** different types of lime, cement, ceramics and other composite materials suitable for construction.

- **Utilize** various physical properties of miscellaneous materials suitable for construction projects.

- **Develop** concrete mix design with its specifications using BIS method.

- **Examine** the fresh, and hardened properties of concrete with its various applications.

TEXT BOOKS:

1. Arora S.P. and Bindra S.P, "The Text Book of Building Construction", Dhanpat Rai and Sons, 5th Edition, 2019.

2. Rangwala, "Building Construction", Charotar Publishing House Pvt. Ltd, 34th Edition, 2022.

CHAIRMAN
BoS (CIVIL)

REFERENCES:

1. Gambhir M L and Neha Jamwal, "Building Materials, Products, Properties and Systems", Tata McGraw Hill Educations Pvt. Ltd, New Delhi, 2014.

2. B.C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, "Building Construction", Laxmi Publications, 11th edition, 2016.

3. M.S.Shetty, "Concrete Technology", S. Chand Publishing House, 2006.

4. A.M.Neville, "Properties of Concrete", Pearson Education India, 5th Edition, 2012.

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

OBJECTIVES:

The students should be made to:

- **Relate** the geological knowledge on structure of earth, weathering phenomena & plate tectonics.

- **Describe** the physical properties of various minerals.

- **Demonstrate** the engineering properties of igneous, sedimentary and metamorphic rocks.

- **Interpret** the geological maps, study of structures and various geophysical methods

- **Analyze** the importance of geological aspects in various civil engineering projects.

UNIT I   PHYSICAL GEOLOGY   9

Geology in civil engineering - Branches of geology - Structure of earth structures and its composition - Weathering of rocks - Scale of weathering - Soils - Landforms and processes associated with rivers, - Wind - Groundwater and Sea relevance to civil engineering - Tectonics - Earthquakes - Seismic Zones in Inda.

UNIT II   MINEROLOGY   9

Physical properties of minerals - Quartz group - feldspar group - Pyroxene - Hypersthene - Augite - Amphibole hornblende - Mica - Muscovite - Calcite - Gypsum - Clay minerals.

UNIT III   PETROLOGY   9

Classification of rocks -Distinction between igneous, sedimentary and metamorphic rocks – Engineering properties of rocks - Description - Occurrence engineering properties - Distribution and uses of Granite, Diorite, Basalt, Sandstone, Limestone, Laterite, Shale, Quartize -Marble - Slate -Gneiss - Schist.

UNIT IV   STRUCTURAL GEOLOGY AND GEOPHYSICAL METHODS   9

Geological maps -Attitude of beds, Study of structure - Folds, Faults and Joints -Relevance to civil engineering, Geophysical methods - Seismic and electrical methods for subsurface investigations.

CHAIRMAN
BoS (CIVIL)

Remote sensing for civil engineering applications - Geological condition necessary for design and construction of Dams - Reservoir - Tunnels - Road cuttings -Coastal protection structure - Investigation of landslide causes and mitigation.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to:

- **Outline** the structure of earth, weathering effects and seismic zones in India.

- **Demonstrate** the various types of minerals and assess its physical properties.

- **Choose** the types of rocks and identify its suitability for various civil engineering projects.

- **Utilize** the subsurface geological methods and study of structures for its suitability in constructions.

- **Examine** geological investigations and suggest preventive measures for major catastrophes.

TEXTBOOKS:

1. Pabin Singh A, "Text book of Engineering and General Geology", S.K. Kataria & Sons, 2nd Edition, Ludhiana 2022.
2. Chenna Kesavulu N, "Text book of Engineering Geology", 2nd Edition, Macmillan India Ltd., 2018.

REFERENCES:

1. Reddy D. V, "Engineering Geology", 2nd Edition, Vikas Publishing House Pvt, Ltd, Noida, 2017.
2. Bell F.G, "Fundamentals of Engineering Geology",1st Edition, B.S Publication, Hyderabad 2016.
3. Blyth F.G, "A Geology for Engineers" , 7th Edition, Blyth, Arnold, London, 2016.

CHAIRMAN
BoS (CIVIL)

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

24CE306L	SURVEYING LABORATORY	L	T	P	C
	(Common to Civil and AGE)	0	0	2	1
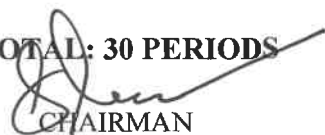
OBJECTIVES:

The students should be made to:

- **Recognize** basic engineering knowledge about principles and fundamentals of chain and plane table surveying.

- **Discuss** compass traversing and plot the layout of the building.

- **Describe** fly and check levelling using dumpy level and measurement of angles.

- **Illustrate** tacheometric constants by using stadia and tangential tacheometry.

- **Calculate** elevation of object using single plane method and using trigonometric levelling.

LIST OF EXPERIMENTS

1. Study of chains and its accessories, aligning, ranging, chaining and marking perpendicular offset.

2. Distance between two inaccessible points using plane table surveying.

3. Compass Traversing – Measuring bearings & arriving included angles.

4. Plot the layout of given plan of building.

5. Fly and check levelling using dumpy level.

6. Measurements of horizontal angles and vertical angles by reiteration and repetition methods.

7. Determination of tacheometric constants.

8. Determination of distance and elevation by stadia and tangential tacheometry.

9. Determination of elevation of an object using single plane method when base is accessible/ inaccessible.

10. Determination of elevation of point by trigonometric levelling.

TOTAL: 30 PERIODS

CHAIRMAN
BoS (CIVIL)

OUTCOMES:

On Successful completion of this course, the students will be able to,

- **Explain** applications of conventional surveying using chain and plane table accessories.
- **Summarize** bearings and plot the layout of the building.
- **Apply** fly and check levelling and to measure horizontal and vertical angles
- **Develop** the additive and multiplying constants to calculate the linear and angular measurements
- **Examine** height of an accessible/ inaccessible points using single plane method and trigonometric levelling

REFERENCES:

1. Arora K.R, "Surveying Vol I , II and III", Standard Book house, 17th Edition, 2019.
2. Satheesh Gopi, Sathishkumar R, Madhu N, "Advanced Surveying, Total Station, GPS and Remote Sensing", Pearson education, 2nd Edition, 2017.
3. Roy S.K "Fundamentals of Surveying", Prentice Hall of India, 2011.
4. Ramamrutham S, "Plane and Geodetic Surveying", Dhanpat Rai, Publishing Company, New Delhi, 2nd Edition, 2016.

Mapping of Cos with POs

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

CHAIRMAN
BoS (CIVIL)

24EEC301L	SOFT SKILLS DEVELOPMENT (Common to All Branches)	L T P C 0 0 2 1

OBJECTIVES:
The students should be made to:
- Enhance the development of students by focusing on soft skills
- Develop skills of the students through individual and group activities
- Shape students' attitude and behaviour through activities
- Analyze the characteristics of the students for self-development
- Prepare themselves for the recruitment processes

UNIT I   SOFT SKILLS ARE IMPORTANT FOR SUCCESS   6
Importance of Soft Skills - Types - Industrial needs - Development of skills – Employees' expectation - Success of employees.

UNIT II   CORPORATE COMMUNICATION   6
Needs and Development of Communication - Customers Relationship - Improving informal communication - Formation of presentations - Public Speaking - Telephone and Email Etiquettes.

UNIT III   DISCUSSIONS   6
Introduction to Discussion - Importance and types of discussion - Spontaneous conversation - Plan for discussions - Panel discussions - Visual Aid discussions - Debate.

UNIT IV   SELF ANALYSIS   6
Who am I - Identifying or searching one's own Strength, Weakness - Opportunities and Threats (SWOT Analysis) - Benefits of SWOT Analysis - Importance of Self Confidence, Self Esteem, Self Development and Self Introspection.

UNIT V   CREATIVITY AND GOAL SETTING   6
Thinking out of the box - Lateral thinking - Positive thinking - Results of smart work - Application of creativities - Short Term and Long Term Goals - Lifetime goals.

TOTAL: 30 PERIODS

OUTCOMES:
On successful completion of this course, the students will be able to,
- Learners will recognize the importance of Soft skills in Professional life.
- Improve oral and Listening Skills.
- Enhance students' ability in GDs, Presentations and interviews.
- Develop one's strength in setting of goals and developing creative.
- Become a good team worker in the society.

CHAIRMAN
BoS (S&H) 14/10

TEXT BOOKS:
1. "SOFT SKILLS", Career Development Centre, Green Pearl Publications, 2015

REFERENCES:
1. Covey Sean, "Seven Habits of Highly Effective Teens", New York, Fireside Publishers, 1998.
2. Carnegie Dale, "How to win Friends and Influence People", New York: Simon & Schuster, 1998.
3. Jeff Butterfield, "Soft Skills for Everyone", Cengage Learning, 2011.

Mapping of COs with POs

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

CHAIRMAN 14/10
BoS (S&H)

24MA401   **NUMERICAL METHODS**   **L T P C**
                                   (Common to CIVIL and MECH)   **3 1 0 4**

OBJECTIVES:
The Student should be made to:
- Introduce the numerical techniques of interpolation in various intervals in real life situations
- Understanding of numerical techniques of differentiation which plays an important role in engineering and technology disciplines
- Determine the absolute and relative error in using a numerical integration technique
- Acquaint the knowledge of various techniques and methods of solving ordinary differential equations
- Evaluate the differential equation with boundary conditions

UNIT I   INTERPOLATION AND APPROXIMATION   **9+3**
Interpolation with unequal intervals - Lagrange's interpolation - Newton's divided difference interpolation - Central difference interpolation: Stirling's Formula, Bessel's Formula - Cubic Splines.

UNIT II   NUMERICAL DIFFERENTIATION   **9+3**
Interpolation with equal intervals - Newton's forward and backward difference formulae- Approximation of derivatives using interpolation polynomials - Maxima and minima of Tabulated Functions.

UNIT III   NUMERICAL INTEGRATION   **9+3**
Numerical integration using Trapezoidal, Simpson's 1/3 rule - Romberg's method - Two point and three point Gaussian quadrature formulae - Evaluation of double integrals by Trapezoidal and Simpson's 1/3 rules.

UNIT IV   INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL
                EQUATIONS   **9+3**
Single Step methods - Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge-Kutta method for solving first order equations - Multi step methods - Milne's predictor corrector methods for solving first order equations.

UNIT V   BOUNDARY VALUE PROBLEMS FOR ORDINARY AND PARTIAL
                DIFFERENTIAL EQUATIONS   **9+3**
Finite difference methods for solving two-point linear boundary value problems - Finite difference techniques for the solution of two dimensional Laplace's and Poisson's equations on rectangular domain - One dimensional heat flow equation by explicit and implicit (Crank Nicholson) methods - One dimensional wave equation by explicit method.

                                                TOTAL: (45+15) PERIODS

                                                          CHAIRMAN
                                                          BoS (S&H) 14/10

OUTCOMES:

On successful completion of the course, the students will be able to,

- Appreciate the numerical techniques of interpolation and error approximations in various intervals in real life situations
- Apply the numerical techniques of differentiation ration for engineering problems
- Apply numerical methods to obtain approximate solutions to mathematical problems
- Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations
- Obtain the solution of differential equation with boundary conditions

TEXT BOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2017.
2. Sankara Rao. K., "Numerical Methods for Scientists and Engineers", Prentice Hall of India Pvt.Ltd, 4th Edition, New Delhi, 2021.

REFERENCES:

1. Kreyszig Erwin, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2018.
2. Chapra. S.C., and Canale.R.P., "Numerical Methods for Engineers, Tata McGraw Hill,5th Edition, New Delhi, 2007.
3. Gerald C.F., and Wheatley. P.O. "Applied Numerical Analysis" 7th Edition, Pearson Education India, 2017.
4. Burden, R.L and Faires J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2018.

Mapping of COs with POs

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

CHAIRMAN
BoS (S&H)

24CE401   **STRENGTH OF MATERIALS - II**   **L T P C**

                                                            3 1 0 4

OBJECTIVES:

The Students should be made to:

- **Recall** simple truss problems using method of joints, method of sections and method of tension coefficient.

- **Explain** the concepts of fixed end moments and reactions for different types of loads.
- **Calculate** crippling load and stresses in thin and thick cylinders under internal pressure.
- **Compute** beam deflections using different methods.
- **Determine** bending stresses and shear centre in symmetrical and unsymmetrical sections.

UNIT I   ANALYSIS OF TRUSSES   9

Perfect, deficient and redundant trusses - Degree of redundancy - Internal and external redundancy - Methods of analysis - Method of joints - Method of sections - Method of tension coefficient - 2D and 3D.

UNIT II   INDETERMINATE STRUCTURES   9

Propped cantilever and fixed beams-fixed end moments and reactions for concentrated load (central, non central), uniformly distributed load, triangular load (maximum at center and maximum at end) - theorem of three moments - analysis of continuous beams - shear force and bending moment diagrams for continuous beams.

UNIT III   COLUMNS AND CYLINDERS   9

Euler's theory of long columns - critical loads for prismatic columns with different end conditions - Rankine Gordon formula - Thin cylinders and shells - under internal pressure - stresses of thin cylinders and shells - Thick cylinders - compound cylinders.

UNIT IV   DEFLECTION OF BEAMS   9

Deflection of beams - Virtual energy method - Double integration method - Macaulay's method - Moment Area method - Conjugate beam method for determinate beams.

CHAIRMAN
BoS (CIVIL)

Unsymmetrical bending - Symmetrical and unsymmetrical sections - Bending stresses in beams - Shear centre for thin walled beams of mono - Symmetrical and unsymmetrical open sections.

TOTAL: 45 PERIODS

OUTCOMES:

On Successful completion of this course, the students will be able to,

- **Interpret** member forces acting on plane trusses by using different methods.
- **Infer** fixed end moments and reactions for different types of loads on propped cantilever and fixed beams.
- **Apply** various formulae to determine critical loads for columns and analyzing internal pressure in thin, thick and compound cylinders and shells.
- **Solve** slope and deflection in determinate beams using various methods.
- **Analyze** the shear center and bending stress calculations for symmetric and unsymmetrical sections.

TEXT BOOKS:
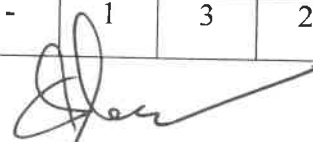
1. Bansal. R.K, "Strength of Materials", Laxmi Publications Pvt. Ltd, New Delhi, 7th Edition, 2024.
2. Rajput R.K, "Strength of Materials (Mechanics of Solids)", S.Chand & company Ltd, New Delhi, 7th Edition, 2022.

REFERENCE BOOKS:

1. Singh. D.K, "Strength of Materials", Ane Books Pvt. Ltd, New Delhi, 4th Edition 2020.
2. Punmia B.C, Ashok Kumar Jain and Arun Kumar Jain, SMTS-II "Theory of Structures", Laxmi Publishing Pvt. Ltd, New Delhi, 12th Edition 2023.

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

24CE402	APPLIED HYDRAULIC ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

The students should be made to:

- **Recognize** various types of flow, properties of open channel and its computation.

- **Realize** the concepts of gradually varied flow and its computational methods.

- **Examine** the depth and loss of hydraulic jump with respect to surges.

- **Analyze** the impact of jets and performance of turbines based on its characteristics.

- **Integrate** the classification of pumps and its work done.

UNIT I   **UNIFORM FLOW**   9

Definition and differences between pipe flow and open channel flow - Types of Flow - Properties of open channel - Sub critical, Super critical and Critical flow - Velocity distribution in open channel - Steady uniform flow - Chezy's equation - Manning equation - Best hydraulic sections for uniform flow - Computation in Uniform Flow - Specific energy and specific force.

UNIT II   **UNIFORMLY VARIED FLOW**   9
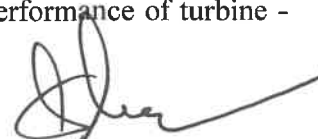
Dynamic equations of gradually varied flow - Water surface flow profile classifications - Hydraulic slope, Hydraulic curve - Profile determination by Numerical method - Direct step method and Standard step method - Change in Grades.

UNIT III   **RAPIDLY VARIED FLOW**   9

Application of momentum equation for RVF - Hydraulic jumps - Types - Energy dissipation - Positive and Negative surges.

UNIT IV   **TURBINES**   9

Impact of Jet on flat curved plates, Stationary and moving - Turbines - Classification - Pelton wheel - Francis turbine - Kaplan turbine - Draft tube - Cavitation - Performance of turbine - Specific speed - Runaway speed

CHAIRMAN
BoS (CIVIL)

Centrifugal pumps - Minimum speed to start the pump - NPSH - Cavitation in pumps - Operating characteristics - Multistage pumps - Reciprocating pumps - Negative slip - Indicator diagrams and its variations - Air vessels - Savings in work done - Submersible pump - deep well pumps

TOTAL: 45 PERIODS

OUTCOMES:

On Successful completion of this course, the students will be able to,

- **Understand** the basic concepts of open channel flow and its classification and relate the uniform flow with specific energy concepts and its applications

- **Explain** the water surface profiles of steady gradually varied flow and its length calculation using direct and standard step methods.

- **Develop** the relationship among the sequent depths of steady rapidly varied flow and calculate the energy loss in hydraulic jump with exposure to positive and negative surges.

- **Experiment** with the working principle of turbines with its performance characteristic curves.

- **Analyze** the characteristic curves and working principles of various pumps.

TEXT BOOKS:

1. Modi P.N and Seth S.M, "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House, New Delhi, 23rd Edition, 2022.

2. Bansal R.K, "Fluid Mechanics and Hydraulic Machines", Laxmi Publications Pvt Ltd, New Delhi,10th Edition, 2019.

REFERENCES:

1. Ven Te Chow, "Open Channel Hydraulics", McGraw Hill, New York, 2nd Edition, 2009.

2. Mays L.W, "Water Resources Engineering", John Wiley and Sons (WSE), New York, 3rd Edition, 2019

3. Subramanya K, "Flow in open channels", Tata McGraw Hill, New Delhi, 5th Edition, 2019.

CHAIRMAN
BoS (CIVIL)

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

OBJECTIVES:

The students can able to:

- **Understand** the various properties and classifications of soil

- **Develop** knowledge on permeability of soil and stress distribution in soil medium

- **Determine** various methods of compaction and consolidation of soil

- **Analyze** shear strength behaviour of cohesive and non-cohesive soil

- **Evaluate** shear strength behaviour of soil using stability analysis of slopes.

UNIT I   SOIL CLASSIFICATION AND COMPACTION   9

Formation and Types of soil - Phase Relationships - Index properties of soils - Consistency limits and Grain size distribution - BIS Classification system - Soil Compaction - Theory -Laboratory and field compaction methods - Compaction - Proctor's test - Moisture - Density relations - Factors influencing compaction behavior of soils.

UNIT II   EFFECTIVE STRESS PRINCIPLES AND PERMEABILITY   9

Soil Water - Static pressure in water - Effective stress concepts in soil - Capillary stress - Darcy's Law - Permeability measurement in the laboratory and field pumping in and pumping out tests -

Factors influencing permeability of soils - Seepage - Introduction to flow nets - Simple problems.

UNIT III   STRESS DISTRIBUTION CONCEPT AND SETTLEMENT   9

Stress distribution - Soil media - Boussinesq's theory - Use of Newmark's Influence chart - Settlement - Components of settlement - Immediate and consolidation settlement - Methods of minimizing settlement - Terzaghi's one dimensional consolidation theory - Computation of rate of settlement - Square root t and log t methods - e-log p relationship - Factors influencing compression behavior of soils.

CHAIRMAN
BoS (CIVIL)

UNIT IV   SHEAR STRENGTH BEHAVIOUR   9

Shear strength of cohesive and cohesionless soils - Mohr - Coulomb's failure theory -Relationship between principal stresses at failure - Measurement of shear strength - Direct shear test - Triaxial compression test - Unconfined compression test and vane shear test - Pore pressure parameters - Cyclic mobility - Liquefaction.

UNIT V   STABILITY OF SLOPES   9

Slope failure mechanisms - Types - Infinite slopes - Finite slopes - Total stress analysis for saturated clay - Fellenius method - Friction circle method - Factor of safety - Use of Stability number - Slope protection measures.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On successful completion of this course, the students will be able to,

- **Understand** the soil classification through index properties and compaction of soil.
- **Outline** the effective stress, permeability properties of soil and seepage through soil.
- **Apply** soil stress due to various loading conditions and compute the settlement of soils.
- **Develop** shear strength of soil using parameters obtained from different laboratory tests.
- **Analyze** the stability of slopes using different methods.

TEXTBOOKS:

1. Punmia B.C, Ashok K Jain, and Arun K Jain, "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd., New Delhi, 17th Edition, 2018.

2. Murthy V N S, "Text book of Soil Mechanics and Foundation Engineering", CBS Publisher and Distributors, New Delhi, 3rd Edition, 2022.

CHAIRMAN
BoS (CIVIL)

REFERENCES:

1. Gopal Ranjan and Rao A.S.R, "Basic and Applied Soil Mechanics", New Age International, New Delhi, 3rd Edition, 2018.

2. Dr Arora. K. R, "Soil Mechanics and Foundations Engineering" Standard Publishers Distribution, 7th Edition, 2019.

Mapping of CO with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

24CE404   CONSTRUCTION TECHNIQUES EQUIPMENTS   L   T   P   C

AND PRACTICE   3   0   0   3

OBJECTIVES:

The students should be made to:

- **Relate** the various construction practices involved in different projects.

- **Understand** the appropriate techniques applicable for sub structure construction sites.

- **Employ** various innovative technologies involved in super structure constructions.

- **Choose** the suitability of equipment employed in industrial structures for various project works.

- **Categorize** different demolition methods for buildings and other structures with its safety precautions.

UNIT I   CONSTRUCTION PRACTICES   9

Specifications, details and sequence of activities - Site Clearance Marking - Excavation - Earthwork Masonry and types - Flooring damp proof courses - Construction joints and types - Precast pavements - Building foundations - Basements - Temporary shed - Centering - Shuttering - Slip form Scaffoldings - De-shuttering forms – Fabrication - erection of steel trusses - Frames - Braced domes - Laying brick - Weather and water proof - Roof finishes - Acoustic and fire protection.

UNIT II   SUB STRUCTURE CONSTRUCTION   9

Techniques of Box jacking - Pipe Jacking under water construction - Diaphragm wall - Tunneling techniques - drill and blast method - Tunnel Boring Machine (TBM) - Piling techniques - Well and Caisson - Sinking Cofferdam - Cable anchoring and grouting - Well points - Dewatering - Stand by Plant - Equipment for underground open excavation.

CHAIRMAN
BoS (CIVIL)

UNIT III   SUPER STRUCTURE CONSTRUCTION   9

Full span launching girders - bridge decks - off shore platforms - Special forms for shells - Techniques for heavy decks - In situ prestressing in high rise structures, Material handling - Erecting light weight components on tall structures - Support structure for heavy Equipment and conveyors - Erection of articulated structures - braced domes and space decks.

UNIT IV   EQUIPMENTS USED IN CONSTRUCTION   9

Earthwork moving operations - Selection of equipment for earthwork - Foundation work and piling - Material handling - Hoisting and lifting equipment - derricks - cranes - gantry and cable ways – Equipment used for Concreting - Mixing - batching - compaction – Equipment for dredging - trenching - tunneling - 3D Printing Machine

UNIT V   DEMOLITION OF STRUCTURES   9

Definition - Demolition methods for buildings and other structures - Common types - Demolition Sequence Techniques - Safety precautions Machines - Explosives - Robotic Machines - Dismantling Techniques - Intrusion techniques.

TOTAL: 45 PERIODS

OUTCOMES:

On Successful completion of this course, the students will be able to,

- **Summarize** the construction practices followed in various construction sites.
- **Classify** the various techniques and equipment used in substructure construction.
- **Identify** the methods employed in superstructure construction.
- **Develop** the working and construction principles of different equipment used in various construction works.
- **Categorize** the methods, sequence and safety precautions required for demolition of structures

CHAIRMAN
BoS (CIVIL)

TEXT BOOKS:

1. Arora S P and Bindra S P. "Building Construction", Dhanpat Rai Publications, New Delhi, 11th Edition, 2020
2. Sarkar, S.K, and Saraswati, S, "Construction Technology", Oxford University press, New Delhi, 9th Edition, 2008.

REFERENCES:

1. Deodhar S V, "Construction Equipment and Job Planning", Khanna Publishers, New Delhi, 7th Edition, 2012.
2. Shetty M S, "Concrete Technology Theory and Practice", S Chand and Co. Pvt. Ltd, New Delhi, 8th Edition, 2009.
3. Bhavikatti S S, "Concrete Technology", Dream tech Press Publishers, 4th Edition, 2019.

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

24MC003   CONSTITUTION OF INDIA   L T P C
                (Common to All Branches)   2 0 0 0

OBJECTIVES:
The students should be made to:
- Understand the history and key principles of the Indian Constitution.
- Learn the roles and functions of the President, Prime Minister, and Parliament.
- Understand the functioning of state governments and local bodies.
- Learn the structure and powers of the Indian Judiciary.
- Understand how financial and legislative powers are shared between the Union and States.

UNIT 1   THE CONSTITUTION - INTRODUCTION   6
The History of the Making of the Indian Constitution - Preamble and the Basic Structure, and its interpretation - Fundamental Rights and Duties and their interpretation - State Policy Principles.

UNIT II   UNION GOVERNMENT   6
Powers and Functions of President and Prime Minister - Council of Ministers – President in relation to his council - Legislature structure and functions of Lok Sabha and Rajya Sabha - Speaker.

UNIT III   GOVERNMENTS OF THE STATES AND LOCAL GOVERNMENT   6
The state executive: General structure – Governor – Council of ministers – State legislature. Local government - Panchayat –Municipality– Power authority and responsibilities municipalities.

UNIT IV   THE JUDICATURE   6
Organization and Composition of Judiciary – Constitution – Appointment - Qualifications - Powers and functions of the supreme court– High courts – Control over subordinate courts.

UNIT V   THE FEDERAL SYSTEM   6
Distribution of financial powers: Need, principles-Underlying distribution of tax revenues-Distribution of legislative power – Interstate relation - Emergency provisions.

TOTAL: 30 PERIODS

OUTCOMES:
On successful completion of the course, the students will be able to,
- Understand the Constitution's history, Preamble, and key rights.
- Comprehend the responsibilities and structure of the Union Government.
- Recognize the roles and functions of state and local governments in India.
- Explain the functions of the Supreme Court and High Courts.
- Understand the division of powers and emergency provisions in the Constitution.

TEXT BOOKS:
1. Basu D.D, "Introduction to Indian Constitution", Prentice Hall of India, New Delhi, 2015.
2. Gupta D.C, "Indian Government and Politics", Vikas Publishing House, New Delhi, 2010.

CHAIRMAN
BoS (S&H)

REFERENCES:

1. Pylee M.V, "Introduction to the Constitution of India", Vikas Publishing House, New Delhi, 2011.
2. Kashyap S, "Our Constitution", National Book Trust, New Delhi, 2010.
3. The Constitution of India, 1950 (Bare Act), Government Publication.
4. Jain M P, Indian Constitution Law, 7th Edition. Lexis Nexis, 2014.
5. Busi S N, Ambedkar B R framing of Indian Constitution, 1st Edition, 2015.

Mapping of COs with POs

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

CHAIRMAN
BoS (S&H)

STRENGTH OF MATERIALS LABORATORY L T P C

0 0 2 1

OBJECTIVES:

The Students should be made to:

- **Identify** the mechanical behavior of mild steel and HYSD bars subjected to tension,
- torsion loading.
- **Evaluate** the compressive strength of wood, brick, and concrete.
- **Investigate** the performance of open and close coiled helical springs.
- **Assess** the impact resistance and hardness of various materials.
- **Determine** bending and shear strength of mild steel.

LIST OF EXPERIMENTS:

1. Tension test on mild steel, structural steel plate and HYSD bars.
2. Torsion test on mild steel rod and HYSD bars.
3. Compression test on wood.
4. Compression test on brick and concrete.
5. Tests on open coiled helical springs.
6. Tests on close coiled helical springs.
7. Izod and charpy impact tests.
8. Determination of rockwell and brinell hardness number.
9. Deflection test on metal beam.
10. Maximum shear strength of mild steel using double shear test.

OUTCOMES:

On Successful completion of this course, the students will be able to,

- **Illustrate** the behaviour of mild steel and HYSD bars under the action of tensile and torsional load.
- **Relate** compression tests on wood, brick, and concrete to determine its load bearing capacity.
- **Identify** stiffness and load deflection characteristics of open and close coiled helical springs.
- **Experiment** with impact resistance and hardness tests to assess various material properties.
- **Examine** bending and shear strength properties of mild steel using the double shear test.

TOTAL 30 PERIODS

CHAIRMAN
BoS (CIVIL)

REFERENCES:

1. Punmia.B.C, Ashok Kumar Jain and Arun Kumar Jain, SMTS - I "Strength of Materials", Laxmi publications, New Delhi,10th Edition, 2024.
2. Singh. D.K, "Strength of Materials", Ane Books Pvt. Ltd., New Delhi, 4th Edition,2020.

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S. No	Description of Equipment	Quantity (nos)
1	UTM of minimum 400 kN capacity	1
2	Torsion testing machine	1
3	Izod/Charpy impact testing machine	1
4	Hardness testing machine (Rockwell, Brinnel)	1 each
5	Beam deflection test apparatus	1
6	Extensometer	1
7	Compressometer	1
8	Dial gauges	Few
9	Le Chatelier's apparatus	2
10	Vicat apparatus	2
11	Mortar cube moulds	10

CHAIRMAN
BoS (CIVIL)

24CE406L	HYDRAULIC ENGINEERING LABORATORY	L	T	P	C
		0	0	2	1

OBJECTIVES:

The students should be made to:

- **Recognize** basic engineering knowledge about flow measurement devices

- **Interpret** incompressible viscous flow properties through pipes and its losses

- **Discuss** the characteristics of pumps with its working principles

- **Categorize** performance characteristics and working principles of various turbines

- **Examine** the concept of buoyancy, metacenter and stability of floating bodies

LIST OF EXPERIMENTS

A. FLOW MEASUREMENT

1. Flow through Notches

2. Flow through Orifice meter/Venturimeter

3. Bernoulli's Experiment

B. LOSSES IN PIPES

4. Determination of friction factor in pipes.

5. Determination of minor losses

C. PUMPS

6. Characteristics of Centrifugal pumps

7. Characteristics of Submersible pump

8. Characteristics of Reciprocating pump
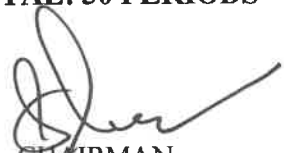
D. TURBINES

9. Characteristics of Pelton wheel turbine

10. Characteristics of Francis turbine

11. Characteristics of Kaplan turbine

E. DETERMINATION OF METACENTRIC HEIGHT

12. Determination of metacentric height of floating bodies.

TOTAL: 30 PERIODS

CHAIRMAN
BoS (CIVIL)

OUTCOMES:

On Successful completion of this course, the students will be able to,

- **Explain** Bernoulli's equation for calculation of flow properties using various measuring devices.

- **Summarize** the friction factor and various losses in pipes.

- **Develop** performance characteristics of rotodynamic pumps and positive displacement pumps

- **Build** the performance characteristics and efficiency of various turbines.

- **Analyze** the metacentric height of floating bodies to calculate buoyancy and stability properties

REFERENCES:

1. Modi P.N and Seth S.M, "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House, New Delhi, 23rd Edition, 2022.

2. Subramanya K, "Fluid Mechanics and Hydraulic Machines", Tata McGraw Hill Edu. Pvt. Ltd, 2011.

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

SI. No	Description of Equipment	Quantity (nos)
1	Open Channel Flow (Flume assembly & Channel with Provision for fixing Notches)	1
2	Venturimeter/Orifice meter	1
3	Bernoulli's Equipment	1
4	Friction factor in pipes	1
5	Minor losses in pipes	1
6	Centrifugal Pump	1
7	Submersible pump	1
8	Reciprocating Pump	1
9	Pelton Wheel turbine	1
10	Francis turbine	1
11	Kaplan turbine	1
12	Metacentric height – Water Tank Ship Model	1

CHAIRMAN
BoS (CIVIL)

24CE407L	SURVEY CAMP	L T P C
	(2 Weeks-During III Semester)	0 0 0 1

OBJECTIVES:

The students should be made to:

- **Describe** traversing, elevation and area calculation using total station.
- **Explain** radial and square contouring by total station.
- **Manipulate** the skills on alignment of roads, canals and column marking of buildings
- **Interpret** offset of buildings and setting of curve.
- **Calculate** latitude, longitude and azimuth using GPS

LIST OF EXPERIMENTS

A.   TOTAL STATION

1. Traversing - elevation - area calculation.
2. Radial Contouring.
3. Square Contouring.
4. Longitudinal and Cross Section.
5. Column marking.
6. Setting out of buildings.
7. Offset of buildings and setting of curve

B.   GPS

8. Triangulation and Trilateration.
9. Traversing
10. Star observation using azimuth

OUTCOMES:

On Successful completion of this course, the students will be able to,

- **Outline** the measurement of elevation, area and traversing by using total station.

- **Extend** the knowledge of radial and square contouring using total station.

- **Experiment** with the problems in alignment of roads, canals and column marking for infrastructure projects.

- **Construct** offset of building and setting of curve using total station.

- **Dissect** traversing and star observation with azimuth using GPS.

CHAIRMAN
BoS (CIVIL)

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

24EEC401L   **LIFE SKILLS AND PERSONALITY DEVELOPMENT**   **L   T   P   C**
                 (Common to All Branches)   **0   0   2   1**

OBJECTIVES:
The students should be made to:
- Create self- confident among the students by the training
- Develop good personality for mature outlook in different circumstances
- Encourage effective presentation skills
- Dramatize role play by assigning the best role
- Enhance team building and time management skills

UNIT I   CAREER PLANNING   6
Introduction - Benefits of Career Planning - Expectation and Development - Guidelines for choosing a Career - Future planning - Evaluation of planning.

UNIT II   ATTITUDE   6
Introduction - Rightness of Attitude and behaviour - Formation of Attitudes - Evolving Behaviour of a person - Creating right attitudes - Approaches of Challenges - Lessons from Attitude.

UNIT III   ROLE PLAYING   6
Introduction - settings of role plays - Principles and Purpose - importance of communication in role plays - Arrangement of points and character - Extempore Talk - Debates - Emotional Intelligence.

UNIT IV   TEAM BUILDING   6
Purpose of Creating Team - Exploring Team roles and Processes - Importance of Building and Developing Strong Team - Leadership Qualities - Success of Team Building.

UNIT V   TIME MANAGEMENT   6
Value of time - Concept and applications of time management - Causes for wasting of time - Methods of Time Management - Diagnosing Time Management - Planning for presentation - To - do - list - Prioritizing work

TOTAL: 30 PERIODS

OUTCOMES:
On successful completion of this course, the students will be able to,
- Improve the leadership skills by identifying the strengths of a team
- Learn to lead a team on a project in an organization
- Helps students to perform on a distinct role and learn to face the challenges
- Build a strong team to achieve their goals with the right choice of people
- Develop the time management skills to achieve success

CHAIRMAN
BoS (S&H)

TEXT BOOKS:

1. "Soft Skills", Career Development Centre, Green Pearl Publications, 2015.

REFERENCES:

1. Thomas A Harris, "I Am Ok, You Are Ok", Harper and Row, New York 1972.
2. Daniel Coleman, "Emotional Intelligence", Bantam Book, 2006.
3. Nira Konar, "Communication Skills for Professionals", Eastern Economy Edition, 2010.

Mapping of COs with POs

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

CHAIRMAN
BoS (S&H) 14/10

24CE501 **DESIGN OF REINFORCED CONCRETE ELEMENTS** **L T P C**
3 1 0 4

OBJECTIVES:

The students should be made to:

- Learn design concepts of beams by Working Stress Method.
- Understand design principles of beams subjected to flexure, shear, and torsion as per the Limit State Method.
- Gain skills in design principles of slabs and staircases as per Limit State Method.
- Extent Design concepts of reinforced concrete columns under axial and eccentric loading conditions using Limit State Method.
- Outline design strategies of reinforced concrete footings as per IS Standards.

UNIT I   DESIGN CONCEPTS AND DESIGN OF BEAMS   12

Design concepts - Concept of elastic method, ultimate load method and limit state method - Advantages of limit state method over other methods. Materials and properties - Grades of concrete and steel - Stress - Strain characteristics of concrete and steel - Fatigue effects - Factor of Safety - Design codes and specifications - Design of singly and doubly reinforced beams by Working stress method- Introduction to Handbook.

UNIT II   LIMIT STATE DESIGN OF BEAM   12

Design of singly and doubly reinforced sections and flanged section subjected to flexure, shear and torsion - Flexural and anchorage bonds - Behaviour of RC members in bond and anchorage - Development length - Concept of serviceability - Serviceability requirements for deflection - Detailing of reinforcement.

UNIT III   LIMIT STATE DESIGN OF SLAB AND STAIRCASE   12

Introduction - Types of slabs - Design of one-way slab - Design of two-way slabs with various boundary conditions - Torsion reinforcement at corners - Design of cantilever slab - Check for shear and deflection - Types of staircases - Design of doglegged stair case - Detailing of reinforcement.

UNIT IV   LIMIT STATE DESIGN OF COLUMN   12

Estimation of effective length of a column - Code requirements - Slenderness limits - Minimum eccentricities and reinforcements - Compression members - Classification of columns - Design of short columns for axial load, combined axial load with uniaxial and biaxial bending - Use of design aids -Introduction to slender columns - Detailing of reinforcement.

CHAIRMAN
BoS (CIVIL)

UNIT V   LIMIT STATE DESIGN OF FOOTING   12

Introduction - Types of footing - Selection of footing - Soil pressures under isolated footings - General design considerations and code requirements - Design of footing for masonry and reinforced walls - Design of axially and eccentrically loaded square and rectangular footings - Design of combined rectangular footings - Detailing of reinforcement.

TOTAL: 60 PERIODS

OUTCOMES:
On successful completion of this course, the students will be able to:

- Summarize design standards of single and doubly reinforced beams by working stress method
- Develop design concepts of RC beams under different loading conditions using Limit State Method.
- Model different types of slabs and staircases as per code and serviceability requirements.
- Apply design strategies in RC columns subjected to axial, uniaxial, and biaxial bending.
- Examine design Principles of isolated and combined footings as per standards

TEXT BOOKS:

1. Krishna Raju N, "Design of Reinforced Concrete Structures", CBS Publishers & Distributors, 4th Edition, New Delhi 2018.
2. VargheseP.C, "Limit State Design of Reinforced Concrete", Prentice Hall of India Pvt. Ltd., 2nd Edition, New Delhi 2010.

REFERENCES:

1. Unnikrishnan Pillai and Devdas Menon, "Reinforced Concrete Design", Third Edition, Tata Mc Graw Hill Publishing Company Ltd., New Delhi, 3rd Edition, 2021.
2. Punmia.B.C., Ashok Kumar Jain, Arun Kumar Jain, "Limit State Design of Reinforced Concrete", Laxmi Publication Pvt. Ltd., New Delhi, 2016.
3. Charles Edward Reynold, James C, Steedman and Anthony J, Thirelfall, "Reinforced Concrete Designers Hand Books", 11th Edition, Taylor and Francis Publications, 2007

IS CODES:

1. IS 456: 2000, "Plain and Reinforced Concrete - Code of Practice".
2. SP 16: 1980, "Design Aids for Reinforced Concrete to IS 456:1978".

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

OBJECTIVES:

The student should be made to:

- Understand the principles of energy methods and virtual work in analysis of structures.
- Learn influence line diagrams and moving load concepts for determinate structures.
- Study the behavior and analysis of arches (three-hinged, two-hinged, fixed) under different loading conditions.
- Outline slope deflection method for statically indeterminate structures.
- Gain knowledge in distributing moments using kani's method for continuous beams and rigid frames.

UNIT I   ENERGY METHODS   9

Strain energy in axial, shear - flexural and torsion - Catingliano's theorems -Principle of virtual work - Unit load method - Application to compute deflection in statically determinate beams - frames and truss - Concepts of Maxewell's reciprocal theorem.

UNIT II MOVING LOADS AND INFLUENCE LINES   9

Moving loads for statically determinate structures-Single - two point load and several point loads -Maximum bending moment and shear force - Equivalent UDL -Absolute maximum bending moment - Enveloping curve - Maximum bending moment - shear force - determination of ILD for shear- moment and reaction for statically determinate beams - trusses-Reversal of stresses in Trusses-Focal Length.

UNIT III ARCHES   9

Arches as structural forms – Example of arch structures – Types of arches – Analysis of three hinged – two hinged – fixed arches – parabolic – circular arches – Settlement and temperature effects.

UNIT IV SLOPE DEFLECTION METHOD   9

Slope deflection method - Equilibrium conditions - Analysis of statically indeterminate beams with and without support settlement - Analysis of portal frames with and without sway.

UNIT V MOMENT DISTRIBUTION METHOD   9

Distribution and carryover of moments - Stiffness and carry over factors - Analysis of continuous beams – Plane rigid frames with and without sway – Kani's method.

                                                         TOTAL: 45 PERIODS

                                                         CHAIRMAN
                                                         BoS (CIVIL)

OUTCOMES:

On Successful completion of this course, the students will be able to:

- Interpret strain energy principles and virtual work to compute deflections in determinate structures.
- Construct influence line diagrams for statically determinate beams and trusses.
- Solve different types of arches considering loading, settlement, and temperature effects.
- Examine indeterminate structures using slope deflection method subjected to sway and settlement cases.
- Analyze moment distribution by kani's method for continuous beams and rigid frame.

TEXT BOOKS:

1. Vaidyanathan R., Perumal P., "Comprehensive Structural Analysis", 13th edition, Vol I and II, Laxmi Publications, 2019.
2. Punmia B.C., "Theory of Structures", 13th edition, Laxmi Publications, 2017.

REFERENCES:

1. Reddy C.S., "Basic Structural Analysis", 3rd edition, Tata Mc Graw-Hill Publications, 2017.
2. Bhavikatti S.S., "Structural Analysis", Vol. 1 and II, 8th edition Vikas Publishing House, 2013.
3. Punmia B.C., "Strength of Materials and Mechanics of Structures" Vol.II, 6th edition, Standard Publishers, 2007.

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

24CE503 ENVIRONMENTAL ENGINEERING -I L T P C
                                                       3 1 0 3

OBJECTIVES:

The students should be made to:

- Understand the need for quality water supply systems as per standards.
- Infer design aspects of intake structures, conveyance and pumping systems.
- Learn design Concepts in the conventional water treatment process.
- Outline advanced water treatment Sustainable technologies.
- Relate water distribution networks and plumbing systems in building.

UNIT I SOURCES AND QUALITY OF WATER 9

Need for protected water supply - objectives of water supply system – quantity estimation of water - Factors affecting per capita consumption, fire demand - Public water supply system – Planning, Objectives, Design period, Population forecasting - Water demand – Sources of water and their characteristics –Surface and Groundwater – Impounding Reservoir – Development and selection of source – Source Water quality – Characterization – Significance – Drinking Water quality standards.

UNIT II COLLECTION AND CONVEYANCE OF WATER 9

Water supply –Types of intake structures – Functions; Pipes and conduits for water – Pipe materials – Hydraulics of flow in pipes – Transmission main design – Laying, jointing and testing of pipes – appurtenances – Types and capacity of pumps – Selection of pumps and pipe materials.

UNIT III CONVENTIONAL WATER TREATMENT 9

Objectives – Unit operations and processes – Principles, functions, and design of water treatment plant units, aerators, flash mixers, Coagulation and flocculation — constructional and operational features of slow sand filters and rapid sand filters - Design and drawing (Line sketch) of slow sand filters and rapid sand filters - Disinfection - Disinfection methods – Types of disinfectants - Residue Management – Operation and Maintenance aspects.

UNIT IV ADVANCED WATER TREATMENT 9

Water softening – Iron and Manganese removal - Defluoridation - Adsorption - Desalination- R.O. Plant – demineralization process –Ion exchange– Membrane Systems – RO Reject Sustainable Management - Operation & Maintenance aspects – Recent advances.

CHAIRMAN
BoS (CIVIL)

Requirements of distribution system - Distribution network layouts - Selection of pipe material - Service reservoirs Functions- Network design - Analysis of distribution networks - Appurtenances – Leak detection. Principles of design of water supply in buildings - House service connection – Fixtures and fittings - Leakage detection and prevention.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to:

- Explain sources and characteristics of quality water.

- Summarize concepts of intake structure and conveyance system for water transmission

- Develop process of conventional treatment of water system.

- Apply design principles in advanced water treatment system.

- Analyze distribution networks of water supply schemes in projects.

TEXT BOOKS:
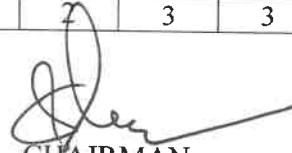
1. Garg, S.K. Environmental Engineering, Vol.I Khanna Publishers, New Delhi, 2019.
2. Modi P N, "Water Supply Engineering", Standard Book House, New Delhi, 6th Edition, 2018

REFERENCES:

1. Punmia B.C , Ashok Kumar Jain, "Water Supply Engineering", Lakshmi Publications (P) Ltd., New Delhi, 2nd Edition,2016.
2. Birdie G S and Birdie J S , "Water Supply and Sanitary Engineering", 5 th Edition, Dhanpat Rai and Sons, New Delhi, 2014.
3. Mcghee Terrence , "Water Supply and Sewerage", McGraw Hill Education, New Delhi, 2014.

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

24CE504	FOUNDATION ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

The Students should be made to:

- Acquire basic knowledge of geotechnical site investigation.
- Understand various types of foundation and design principles.
- Design different types of footings as per codal practice.
- Discuss different types of pile foundation with its load carrying capacity.
- Analyze various earth pressure theories.

UNIT I SITE INVESTIGATION AND SELECTION OF FOUNDATION 9

Scope & Objectives - Methods of exploration - Depth and spacing of bore holes - Sampling of soil - Methods of sampling - Penetration tests (SPT, SCPT and DCPT) – Geophysical methods - Seismic Refraction Method and Electrical Resistivity Method - Interpretation - Bore log report - Requirements of good foundation - Factors governing location and depth of foundation -Types & Selection of foundation.

UNIT II SHALLOW FOUNDATION 9
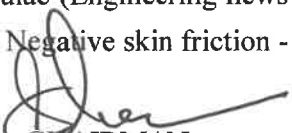
Bearing capacity of shallow foundation on homogeneous deposits - Terzaghi's formula and BIS formula - Bearing Capacity from in-situ tests (SPT, SCPT and Plate load) - Settlement - Components of settlement - Determination of settlement of foundations on granular and clay deposits - Allowable settlements (As per IS codal provisions) - Methods of minimizing total and differential settlement.

UNIT III FOOTINGS AND RAFT 9

Contact pressure distribution below footings –Types of Footing - Isolated – Square and Circular footing, Combined – Rectangular and Trapezoidal combined footing, Strap footings & Mat foundation - Types, uses and proportioning - Allowable bearing pressure for raft foundation as per IS codal provisions.

UNIT IV PILE FOUNDATIONS 9

Types of piles and their function - Factors influencing the selection of pile - Carrying capacity of single pile in granular and cohesive soil - Static formula - Dynamic formulae (Engineering news and Hiley's) - Capacity from in-situ tests (SPT, SCPT and Pile load test) - Negative skin friction -

CHAIRMAN
BoS (CIVIL)

Group capacity by different methods (Feld's rule and block failure criterion) - Settlement of pile groups.

UNIT V EARTH PRESSURE 9

Active and passive earth pressure - Rankine's theory - Coloumb's wedge theory – Culmann's Graphical Method - Earth pressure on retaining walls including the effect of surcharge for C and C-φ soil under dry and saturated conditions.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to:

- Acquire knowledge on soil investigation report including laboratory and field investigation test results.
- Evaluate bearing capacity of soil and design of shallow foundation.
- Design various types of footings as per IS codal provisions
- Determine load carrying capacity of piles and design of pile foundations.
- Perform lateral earth pressure analysis by various earth pressure theories.

TEXT BOOKS:
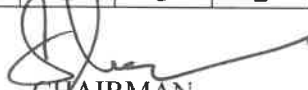
1. Punmia.B.C., Ashok K.Jain and Arun K Jain, "Soil Mechanics and Foundations", Laxmi Publications, 18th Edition, New Delhi, 2023.
2. Dr.K.R Arora "Soil Mechanics and Foundation Engineering", Standard publishers Distributors, 7th Edition, 2020.

REFERENCES:

1. Gopal Ranjan Rao, "Basic and Applied Soil Mechanics" New Age International, New Delhi, 4rd Edition, 2022.
2. V.N.S.Murthy, "Text book of Soil Mechanics and Foundation Engineering", CBS Publishers & Distributors, New Delhi, 2018.

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

24CE505L   GEOTECHNICAL ENGINEERING LABORATORY   **L T P C**

                                                          0 0 3 1

OBJECTIVES:

The Students should be made to:

- Develop skills to test the soils for their index and engineering properties.
- Characterize the soil based on their properties.
- Determine insitu density and compaction characteristics.
- Understand permeability characteristics of soil.
- Illustrate consolidation and shear properties of soil.

I. DETERMINATION OF INDEX PROPERTIES
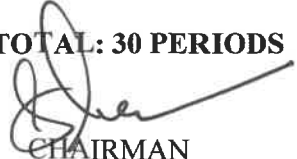
1. Determination of water content by Hot Air Oven method
2. Specific gravity of soil solids.
3. Grain size distribution – Mechanical Sieve analysis and Hydrometer Analysis.
4. Consistency Limits -Liquid limit, Plastic limit and Shrinkage limit tests.
5. Differential free swell test.
6. Determination of Coefficient of permeability by Allen Hazen's Formula

II.   DETERMINATION   OF   INSITU   DENSITY   AND   COMPACTION CHARACTERISTICS

1. Field density test (Sand replacement method and core cutter method).
2. Determination of moisture - Density relationship using standard Proctor compaction test.
3. Determination of relative density.

III. DETERMINATION OF ENGINEERING PROPERTIES

1. Permeability determination (Constant head and falling head methods)
2. One dimensional consolidation test (Determination of co-efficient of consolidation only)
3. Direct shear test in cohesionless soil.
4. Unconfined compression test in cohesive soil.
5. Laboratory vane shear test in cohesive soil.
6. Tri-axial compression test in cohesionless soil (Demonstration only).
7. California Bearing Ratio Test.

TOTAL: 30 PERIODS

CHAIRMAN
BoS (CIVIL)

OUTCOMES:

On successful completion of this course, the students will be able to:

- Calculate index properties of soil.
- Perform grain size distribution using both sieve analysis and hydrometer analysis.
- Execute compaction and field density test.
- Determine permeability of soil using both constant and falling head method.
- Conduct consolidation and shear test in soil.

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

SI.No	Description of Equipment	Quantity
1.	Sieves	2 sets
2.	Hydrometer	2 sets
3.	Liquid and Plastic limit apparatus	2 sets
4.	Shrinkage limit apparatus	3 sets
5.	Proctor Compaction apparatus	2 sets
6.	UTM of minimum of 20kN capacity	1
7.	Direct Shear apparatus	1
8.	Thermometer	2
9.	Sand replacement method accessories and core cutter method accessories	2
10.	Tri-axial Shear apparatus	1
11.	Three Gang Consolidation test device	1
12.	Relative Density apparatus	1
13.	Van Shear apparatus	1
14.	Weighing machine - 20kg capacity	1 No
15.	Weighing machine - 1kg capacity	3 No
16.	Hot air Oven	1

CHAIRMAN
BoS (CIVIL)

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

24EEC501L	PROFESSIONAL SKILLS DEVELOPMENT	L	T	P	C
	(Common to All Branches)	0	0	2	1

OBJECTIVES:

The student should be made to:

- Sharpen problem solving skills and to improve thinking ability of the students
- Drive the students to use language with great commitment and cooperation
- Expertise the creative thinking and presentation skills to meet company needs
- Develop and foster the soft skills through individual and group activities
- Expose students to right attitudinal and behavioural thoughts

UNIT I   INTRODUCTION TO BASIC ARITHMETIC AND PERSONALITY TRAITS   6

Aptitude - Numbers, Average, Percentage, Profit and loss, Picture pattern.
Soft skills - Personality development, Professional ethics, Perception insights, attitude and behavioral changes.

UNIT II   CONCEPT OF PROPORTIONALITY & INTERPERSONAL SKILLS   6

Aptitude - Time and work, Pipes and cisterns, Series completion, Critical reasoning.
Soft skills - Developing self - esteem, Significance of interpersonal behaviour and interpersonal relationships.

UNIT III   AN APPROACH TO COGNITIVE APTITUDE AND LEADERSHIP SKILLS   6

Aptitude - Time, speed and distance, Boats and streams, Races and games, Syllogism.
Soft skills - Leadership skills - Characteristics and importance of leadership, Roles and responsibilities of a good Leader

UNIT IV   CONTEMPORARY APTITUDE AND SITUATIONAL RESPONSES   6

Aptitude - Crypt arithmetic, Ranking, Logarithms, Cubes, Analogy.
Soft skills - Decision making - Processes and challenges, Creative and Critical thinking.

UNIT V   NON-VERBAL REASONONG AND INFLUENCING OTHERS   6

Aptitude - Clocks, Non - verbal reasoning, Permutation, Classifications.
Soft skills - Presentation skills - Make use of visual aids with modern tools, Insights on persistence and perseverance.

TOTAL: 30 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Ability to solve both analytical and logical problems in an effective manner
- Practice to organize and convey the information in such an optimistic way.
- Deliver a professional and constructive presentation
- Recognize explicit assumptions and their consequences
- Access the needed information effectively and efficiently

CHAIRMAN 14/10
BoS (S&H)

TEXT BOOKS:
1. Aggarwal R S, "Quantitative Aptitude for Competitive Examinations", S Chand Publishing New Delhi, Revised Edition Feb 2017.
2. MurtyG R K, "Soft Skills for Success", DGM Icfai Books, Revised Edition, 2005.

REFERENCES:
1. Abhijit Guha, "Quantitative Aptitude for All Competitive Examinations", McGraw Hill Education; Sixth edition 2016.
2. AggarwalRS, "A Modern Approach to Verbal & Non-Verbal Reasoning", S Chand Publishing; New Delhi, 2018.
3. Arun Sharma, "How to Prepare for Quantitative Aptitude for the CAT", McGraw Hill Education; Eighth Edition, 2018.
4. Covey Sean, "Seven Habits of Highly Effective Teens", Fireside Publishers, New York, 1998.
5. Carnegie Dale, "How to win Friends and Influence People", Simon & Schuster, New York, 1998.

Mapping of COs with POs

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

CHAIRMAN
BoS (S&H) 141

24CE101PE INTEGRATED WATER RESOURCES MANAGEMENT   L T P C

                                                                   3   0   0   3

OBJECTIVES:

The student should be made to:

- Gain skills in principles of systems approach and optimization techniques in Sustainable water resources management.
- Learn linear programming for irrigation water allocation and reservoir operation in single and multi-reservoir systems.
- Understand dynamic programming models to solve water allocation and reservoir operation problems.
- Infer simulation models for multi-objective planning, formulation, and selection.
- Outline economic aspects and reservoir system operations systems.

UNIT I   SYSTEM APPROACH   9

Water as a global issue - Key challenges - Definition of IWRM- Key elements and pillars of IWRM -Types of system -Sustainable Systems approach - System analysis - Optimization using calculus - Linear programming - Dynamic programming -Simulation - Combination of simulation and optimization.

UNIT II   LINEAR PROGRAMMING   9
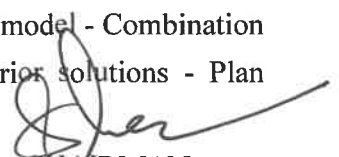
Introduction to operations research - Irrigation water allocation for single crop - multi-reservoir system basics - Reservoir operation for irrigation planning - Overview of reservoir operation for hydropower optimization.

UNIT III   DYNAMIC PROGRAMMING   9

Introduction - Bellman's principle of optimality - Solution of DP problems using backward and forward recursion -Water allocation problem - Characteristics of a DP problem - Shortest route problem - Reservoir operation problem.

UNIT IV   SIMULATION   9

Definition - Basic principles and concepts - Components of a simulation model - Combination of simulation and optimization -Multi objective planning - Non inferior solutions - Plan formulation - Plan selection.

CHAIRMAN
BoS (CIVIL)

Basics of engineering economics - Economic analysis - Conditions of project optimality - Life cycle cost analysis - Reservoir sizing - Reservoir operation strategies -Introduction to uncertainty modeling - Chance constrained linear programming - Stochastic dynamic programming for reservoir operation - Monte Carlo simulation techniques.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to:

- Summarize effective system analysis and optimization approaches for water resources systems.
- Develop irrigation water allocation and reservoir operation strategies under various conditions.
- Solve water resource problems using dynamic programming techniques.
- Build simulate models for multi objective water planning and evaluation.
- Analyse reservoir systems using economic analysis and uncertainty based programming approaches.

TEXT BOOKS:
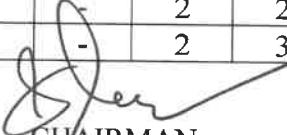
1. Jaya Rami Reddy P., "Hydrology", Laxmi Publications, 3rd Edition, 2016.
2. Subramanya K., "Engineering Hydrology", McGraw Hill Education (India) Private Limited, 4th Edition, 2013.

REFERENCES:

1. Raghunath H.M., "Hydrology: Principles, Analysis, Design, New Age International Private Limited, 4th Edition, 2022.
2. VenTe Chow, Maidment, David R. Maidment and Lorry W. Mays, L.W. "Applied Hydrology", McGraw Hill Education, 1st Edition, 2017.

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

24CE102PE	WATERSHED MANAGEMENT	L T P C
		3 0 0 3

OBJECTIVES:

The student should be made to:

- Understand the fundamental concepts of watershed management
- Learn the techniques for data collection, planning, and preparation of watershed development plans.
- Gain knowledge of participatory watershed management and soil moisture conservation. .
- Explore various water conservation practices for different types of land.
- Relate government initiatives and technologies in watershed development programmes.

UNIT I	INTRODUCTION	9

Watershed - Definition and Classification - Concept - Objectives - Components - Basic factors influencing watershed development - Land Capability Classification - priority watersheds land resource regions in India.

UNIT II	WATERSHED PLANNING	9
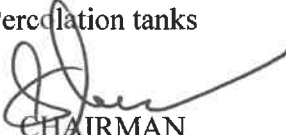
Planning principles - Collection of data - present land use - Methodology of planning a watershed management - identification of watershed problems - socio-economic issues - Estimation of costs and benefits - Financial plan - selection of implementation agency - application of Remote Sensing and GIS in watershed

UNIT III	WATERSHED MANAGEMENT	9

Participatory Watershed Management - Strategies - Identification of Problems - Watershed Development Plan - Runoff management - Factors affecting runoff - Temporary & amp Permanent gully control measures - Sustainable Water conservation practices in irrigated lands - Soil and moisture conservation practices in dry lands.

UNIT IV	WATER CONSERVATION PRACTICES	9

In-situ &amp - Ex-situ moisture conservation principle and practices - Afforestation principle - Micro catchment water harvesting- Groundwater recharge - percolation ponds - Rainwater Harvesting-Catchment - Harvesting structures - Roof water harvesting- Sustainable Soil Moisture Conservation - Check Dams-Artificial Recharge-Farm Ponds- Percolation tanks

CHAIRMAN
BoS (CIVIL)

RVP- HADP - NWDPRA - Other similar projects operated in India - Govt. of India guidelines on watershed development programmes - Watershed based rural development - infrastructure development - Role of NGOs in watershed development - Watershed Approach in Government Programmes-Developing Collaborative know how - People Participation.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to:

- Interpret factor influencing watershed development.
- Construct watershed development plan.
- Identify watershed management problems and its control measures
- Make use of water conservation principle and practices.
- Analyze watershed development programmes for rural and infrastructure Development.

TEXT BOOKS:
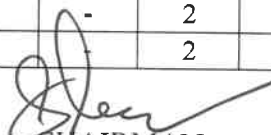
1. Vedula, S and Majumdar P P, "Water Resources Systems – Modeling Techniques and Analysis", Tata McGraw Hill, New Delhi, 5th Edition, 2010.
2. Daniel P Loucks and Eelco Van Beek, "Water Resource Systems Planning and Management", Springer Publication, 1st Edition, 2017.

REFERENCES:

1. Taha H A, "Operation Research an Introduction", Pearson Prentice Hall, Pearson Education, New Jersey, 8th Edition, 2007.
2. Murthy, V.V.N. Land and water management, Kalyani publishing, New Delhi, 2005.
3. Tideman,E.M.,"Watershed Management",Omega Scientific Publishers, New Delhi,1996.
4. Suresh,R. Land and water management principles, Standard Publishers & Distributors, New Delhi, 2008.

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

24CE103PE	GROUNDWATER ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

The student should be made to:

- Learn various aquifer types and hydrogeological parameters.
- Understand principles of well hydraulics for steady and unsteady flows.
- Gain Skills in groundwater management practices and models.
- Infer groundwater quality using standard chemical and physical parameters.
- Outline suitable groundwater conservation and recharge techniques.

UNIT I   HYDRO GEOLOGICAL PARAMETERS   9

Introduction - Water bearing properties of rock - Type of aquifers - Aquifer properties - Permeability, specific yield, and storage coefficient - Methods of Estimation - GEC norms - Steady state flow - Darcy's Law - laboratory permeability test - types of aquifers - water level fluctuations. - Determine of hydraulic conductivity.

UNIT II   WELL HYDRAULICS   9

Objectives of ground water hydraulics -Ground water equation - Steady radial flow -Well in uniform flow – Unsteady state flow in a confined aquifer - Unconfined aquifer -Partial penetrations of wells - Theis method - Jacob method - Law of Times - Theis Recovery - Image well theory - Partial penetrations of wells - Well losses.

UNIT III   GROUND WATER MANAGEMENT   9
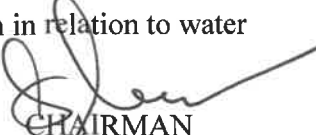
Need for Management Model - Database for Groundwater Management - Groundwater balance study- Introduction to Mathematical model- Ground water basin investigations - Data collection - Alternative basin yields - Evaluation of perennial yield - Basin management by conjunctive use - Examples of ground water management.

UNIT IV   GROUNDWATER QUALITY   9

Ground water chemistry - Origin, movement and quality - Water quality standards - Drinking water - Industrial water - Water quality criteria - Changes in chemical composition -Dissolved gases - Temperature - Saline ground water - Groundwater Pollution and legislation.

UNIT V   SUSTAINABLE GROUNDWATER CONSERVATION   9

Concept of artificial recharge - Recharge methods - Soil aquifer treatment (SAT) -Managed aquifer recharge (MAR) -Seawater Intrusion and Remediation - Pollution in relation to water

CHAIRMAN
BoS (CIVIL)

use - Municipal sources and causes - Industrial sources and causes - Agricultural sources and causes - Attenuation of pollution - Evaluation of pollution potential -Monitoring Sustainable ground water quality.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to:

- Illustrate the basic properties of various hydrogeological parameters.
- Summarize steady and unsteady flow in confined and unconfined aquifers in well hydraulics.
- Organize stability of a groundwater management system.
- Make use of groundwater quality analysis and recommend suitable measures.
- Categorize sources, causes, and control measures for ground water conservation.

TEXT BOOKS:

1. Todd D K and Larry W Mays, "Ground Water Hydrology", John Wiley and Sons, New York, 3rd Edition, 2011.
2. Raghunath H M, "Ground Water", New Age International, Pvt. Ltd., New Delhi, 3rd Edition, 2007.

REFERENCES:

1. Charles Fitts "Groundwater Science", Academic Press, 1st Edition, 2002.
2. Ramakrishnan S, "Ground Water" K.J. Graph arts, Chennai, 1998.
3. Jacob Bear, "Hydraulics of Groundwater", Dover Publication, 2012.
4. John H Cushman and Daniel M Tartakovsky, "The Handbook of Groundwater Engineering", CRC Press; 3rd Edition, 2016.

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

24CE104PE　　　**RURAL WATER RESOURCES MANAGEMENT**　　L　T　P　C

　　　　　　　　　　　　　　　　　　　　　　　　　　　　3　0　0　3

OBJECTIVES:

The students should be made to:

- Recall water management terms and identify components of hydrological cycle
- Explain groundwater parameters, aquifer types, recharge, and discharge processes.
- Describe groundwater properties, rural storages, lake irrigation, and mass balance.
- Discuss various rural water management practices and their associated benefits.
- Apply rural water data and tools to solve management case studies.

UNIT I　　HYDROLOGICAL CYCLE　　　　　　　　　　　　9

Introduction to water to water management - Units and quantification of water- LPCD - Hydrological Cycle - Precipitation - Evapotranspiration -Surface Runoff/Discharge - Water storage -Soil Moisture.

UNIT II　　GROUNDWATER ASSESSMENT　　　　　　　　9

Important parameters for groundwater assessment - Groundwater Monitoring - Issues - Groundwater hydrology - Baseflow - Aquifers- Different types of aquifers - Groundwater discharge and Recharge.

UNIT III　　SURFACE WATER HYDROLOGY　　　　　　　　9

Groundwater hydrology -Porosity - Specific yield - Permeability and Hydraulic conductivity - Water levels and Hydraulic head - Types of surface storages - Rural water bodies and lakes - Methods of irrigation from lakes - Loss and conversion of lakes - Mass balance equation.
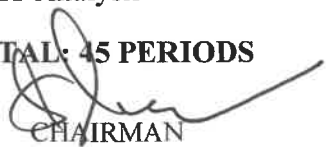
UNIT IV　　RURAL WATER RESOURCE MANAGEMENT INFRASTRUCTURE　　9

Large irrigation dams - Check dams and associated benefits - Ganges water Machine - Managed aquifer recharge - No one size fits all approach – Normal rainwater harvesting - Harnessing -Agroforestry.

UNIT V　CASE STUDIES IN RURAL WATER RESOURCE MANAGEMENT　　　9

Rural water Data - Solving case studies in rural water resource management - Rural hydrological databases -India water resources information system - SWAT Analysis

　　　　　　　　　　　　　　　　　　　　　　　TOTAL: 45 PERIODS

　　　　　　　　　　　　　　　　　　　　　　　　CHAIRMAN
　　　　　　　　　　　　　　　　　　　　　　　　BoS (CIVIL)

OUTCOMES:

On Successful completion of this course, the students will be able to:

- Identify key components of water management and hydrological cycle processes.
- Recognize groundwater assessment parameters, aquifer types, and recharge processes.
- Outline groundwater properties, rural storages, lake irrigation, and mass balance.
- Integrate various rural water management practices and their associated benefits.
- Analysis hydrological data and tools to analyze rural water systems

TEXT BOOKS:

1. Garg S.K, "Water Supply Engineering: Environmental Engineering", Khanna Publishers, New Delhi, 27rd Edition, 2022.
2. Raghunath H.M, "Hydrology", New Age International Publishers, New Delhi, 4th Edition, 2022.

REFERENCES:

1. Todd, D.K. and Mays, L.W., "Groundwater Hydrology", Wiley India Pvt Ltd., New York, 3rd Edition, 2005.
2. Michael, A.M., 'Irrigation: Theory and Practice", Vikas Publishing House Pvt Ltd, New York, 2nd Edition, 2008
3. Vedula, S. and Majumdar, P.P , "Water Resources System Modeling Techniques and analysis", Tata McGraw Hill , New Delhi, 2005

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

24CE105PE   HYDROLOGY AND WATER RESOURCES ENGINEERING   L T P C

(Common to CIVIL and AGE)   3 0 0 3

OBJECTIVES:

The students should be made to:

- Understand hydrological cycle and various forms of precipitation, abstraction losses, and their measurements.
- Learn methods to estimate runoff and hydrograph analysis.
- Infer the causes, classification, and estimation of floods and droughts.
- Gain knowledge about reservoir design, sedimentation, and erosion.
- Outline groundwater flow mechanisms and artificial recharge methods.

UNIT I   PRECIPITATION AND ABSTRACTIONS   9

Hydrological cycle - Types of precipitation - Forms of precipitation -Measurement of Rainfall - Probable maximum precipitation - Spatial analysis of rainfall data using Thiessen and Isohyetal methods - Interception - Evaporation measurements and evaporation suppression - Infiltration-Horton"s equation - double ring infiltrometer.

UNIT II   RUNOFF   9
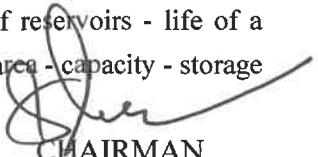
Introduction, necessity, runoff- different methods, factors affecting runoff- Runoff estimation - Watershed, catchment and basin - Catchment characteristics - factors affecting runoff - Run off estimation - Infiltration indices - Stage discharge relationships flow measurements - Hydrograph - Unit Hydrograph - Synthetic Unit Hydrograph.

UNIT III   FLOOD AND DROUGHT   9

Flood frequency studies - Natural Disasters - Flood Estimation - Frequency analysis - Flood control - Flood routing - Reservoir flood routing-Definitions of droughts - Meteorological - hydrological and agricultural droughts - IMD method - NDVI analysis - Drought Prone Area Programme (DPAP).

UNIT IV   RESERVOIRS   9

Classification of reservoirs - storage zones of a reservoir - fixing capacity of reservoirs - life of a reservoir - General principles of design - site selection - spillways - elevation - area -capacity - storage

CHAIRMAN
BoS (CIVIL)

estimation - sedimentation - life of reservoirs - rule curve - Estimation of Erosion/sediment yield using SWAT Model.

UNIT V GROUNDWATER AND MANAGEMENT 9

Source of groundwater - Classification and types - Types of aquifers and properties of aquifers-governing equations - Flow through layered soil - steady and unsteady flow - artificial recharge - RWH in rural and urban areas - GEC norms - Environmental Protection Law - Environmental Constraints on water Resources Development.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to:

- Demonstrate precipitation, observations and hydrological process
- Summarize catchment and runoff characteristics
- Interpret flood and drought frequency studies in natural disaster
- Develop the reservoir characteristics and its general principles of design
- Examine groundwater management

TEXTBOOKS:
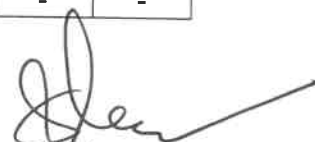
1. Subramanya K., "Engineering Hydrology", McGraw Hill Education (India) Private Limited, 4th Edition, 2013.
2. Jaya Rami Reddy P., "Hydrology", Laxmi Publications, 3rd Edition, 2016.

REFERENCES:

1. David K. Todd and Larry W. Mays "Groundwater Hydrology", Wiley India Pvt Ltd, 3rd Edition, 2011.
2. VenTe Chow, Maidment, David R. Maidment and Lorry W. Mays, L.W. "Applied Hydrology", McGraw Hill Education, 1st Edition, 2017.
3. Raghunath H.M., "Hydrology: Principles, Analysis, Design, New Age International Private Limited, 4th Edition, 2022.

Mapping of COs with POs

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

CHAIRMAN
BoS (CIVIL)

24CE106PE	COASTAL ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

The students should be made to:

- Understand coastal features and morphology.
- Outline wave theory and dynamics
- Explain wave transformation and shore currents.
- Infer cross shore and longshore sediment transport to predict shoreline changes.
- Interpret sustainability, environmental and socio-economic impacts of different coastal production methods.

UNIT I   COASTAL ENVIRONMENT   9

Beaches - Coastal features - Coastal Zonation - EEZ -Inshore and Offshore Areas – Mean Sea level - Basics of Tides and Waves - Coastal Morphology.

UNIT II   WAVES DYNAMICS   9

Basics of waves - Classification - Wave Theory - Physical Characteristics of different types of waves - Linear Wave Theory - Wave celerity - Velocities -Accelerations - Displacements - Wave dynamics in shallow and deep-water conditions.

UNIT III   NEARSHORE WAVE TRANSFORMATION   9
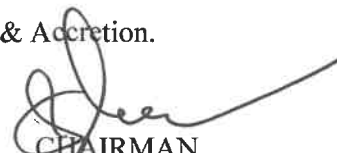
Shoaling, refraction, diffraction and breaking– Interaction currents and waves- near shore currents wave run-up and overtopping

UNIT IV   SEDIMENT DYNAMICS AND TRANSPORT   9

Introduction to sediments, Sediment Analysis, types and sizes of sediments, sedimentation processes, sediment Supply & movement - Cross-shore sediment transport - Long shore sediment transport - Shoreline Changes - Shoreline Evolution - Erosion & Accretion.

CHAIRMAN
BoS (CIVIL)

Design of shore defense structures; Hard Engineering measures - Sea walls, Revetments, Bulkheads, Dikes, Groynes, Breakwaters; Soft Engineering measures – Artificial Reefs, Beach nourishment, Dune regeneration, Salt marsh Creation, Bio shields - Case studies

OUTCOMES:

On successful completion of this course, the students will be able to:

- Understand the basic concepts of coastal environment.
- Calculate sea state parameters (wave height, wave period, water levels) in shallow and deep water conditions.
- Explain the principles of near-shore wave transformation.
- Apply the sediment and its transport processes.
- Analyze measures to protect beaches from erosion due to waves and currents.

TEXT BOOKS:
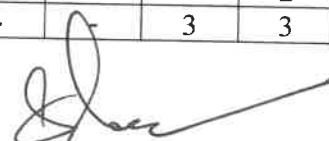
1. Mani, J.S., "Coastal Engineering", 2nd Edition, PHI Learning, 2021.
2. Kamphuis, J.W., "Introduction to Coastal Engineering and Management", 3rd Edition, World Scientific, 2020

REFERENCES:

1. Ippen, A.T.,"Estuary and Coastline Hydrodynamics", McGraw-Hill Book Company, Inc., New York, 2019.
2. Sorenson, R.M., "Basic Coastal Engineering", A Wiley-Interscience Publication, NewYork, 2018.

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

| 24CE107PE | AVAILABILITY AND MANAGEMENT OF | L | T | P | C |
| | GROUNDWATER RESOURCES | 3 | 0 | 0 | 3 |

OBJECTIVES:

The students should be made to:

- Describe hydrological cycle, groundwater conservation needs and aquifer formations
- Explain vadose, saturated zones, aquifer types and related parameters.
- Apply Darcy's law, estimate runoff and analyze well hydraulics.
- Analyze rainfall data, infiltration and plan groundwater resource management.
- Evaluate rainwater harvesting methods and climate change impacts on water.

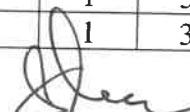## UNIT I HYDROLOGICAL CYCLE 9

Introduction of hydrological cycle - Need for conservation of groundwater resources - Geologic formations as aquifers

UNIT II HYDROGEOLOGICAL ZONES 9

Vadose - Saturated zones - Confined and unconfined aquifers and their parameters – Porosity – Permeability - Transmissivity and storage coefficient

UNIT III GROUNDWATER FLOW AND WELL HYDRAULICS 9

Law of groundwater movement - Darcy's law and applications - Estimation of Subsurface runoff - Types of wells - Well hydraulics

UNIT IV RAINFALL ANALYSIS AND GROUNDWATER ESTIMATION 9

Measurement of rainfall - Index of wetness - Infiltration rate - Estimation of total annual replenishable natural groundwater recharge - Groundwater resources planning and management

CHAIRMAN
BoS (CIVIL)

Rainwater harvesting and artificial groundwater recharge - Impact of climate change on water resources

TOTAL: 45 PERIODS

OUTCOMES:

On Successful completion of this course, the students will be able to:

- Understand the components of the hydrological cycle, need for groundwater conservation, and types of aquifer-forming geologic formations.

- Infer vadose and saturated zones, aquifer types, and their hydrogeological parameters.

- Analyze well hydraulics & apply Darcy's law to groundwater flow, estimate subsurface runoff.

- Evaluate rainfall data and infiltration to plan groundwater resource management.

- Explain the rainwater harvesting methods and climate change impacts on water.

TEXT BOOKS:

1. Garg S.K, "Water Supply Engineering: Environmental Engineering", Khanna Publishers, New Delhi, 35th Edition, 2022.

2. Todd, D.K. and Mays, L.W., "Groundwater Hydrology", Wiley India Pvt Ltd., New York, 3rd Edition, 2011.

REFERENCES:

1. Mukerjee P.K, "Geology", World Press Private Ltd, West Bengal, 2013.

2. Parbin Singh, "Engineering & General Geology" ,S.K. Kataria & Sons, New Delhi, Eight Edition, 2023

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

24CE201PE   **LEADERSHIP AND TEAM EFFECTIVENESS**   **L   T   P   C**

                                                             3   0   0   3

OBJECTIVES:

The students should be made to:

- Provide a framework for the students to understand the importance of Leadership and team effectiveness in organizations.
- Develop an understanding of the interpersonal processes and group dynamics.
- Understand a theoretical understanding of leadership practices in organizations.
- Evaluate an understanding of factors influencing teamwork and team leadership.
- Gain the role of leadership in the development of an institution.

UNIT I   INTRODUCTION TO LEADERSHIP & TEAM MANAGEMEN   9

Introduction to Leadership & Team Management; Leadership Myths; Interactional Framework for analyzing leadership; Leadership Development: The First 90 Days as a Leader; Leader Development- The Action-Observation-Reflection Model. Leadership Attributes; Personality Traits and Leadership; Personality Types and Leadership; Intelligence and Leadership; Emotional Intelligence and Leadership.

UNIT II   LEADERSHIP MYTHS & FACTS-I   9

Power and Leadership; The art of influence in leadership; Leadership and "Doing the Right Things; Character-Based Approach to Leadership; Role of Ethics and Values in Organizational Leadership Leadership Behaviour; Leadership Pipeline; Assessing Leadership Behaviors: Multi- rater Feedback Instruments; The Dark Side of; Leadership- Destructive Leadership; Managerial Incompetence and Derailment Conflict Management Negotiation and Leadership; Leadership under a crisis situation; The Situation and the Environment; Culture and Leadership; Global Leadership Motivation and Leadership; Introduction to Groups and Teams; Characteristics of Leader, Follower and Situation; Group Dynamics; Team Formation

UNIT III   LEADERSHIP MYTHS & FACTS-II   9

Negotiation and Leadership; Leadership under a crisis situation; The Situation and the Environment; Culture and Leadership; Global Leadership. Motivation and Leadership; Introduction to Groups and Teams; Characteristics of Leader, Follower and Situation; Group

Dynamics; Team Formation. Delegation and Empowerment; Leading teams: Enhancing teamwork within a group; The leader's role in team-based organizations; Leader actions that foster Teamwork Effectiveness; Offsite training and team development.

CHAIRMAN
BoS (CIVIL)

UNIT IV INTERACTIONAL FRAMEWORK FOR ANALYZING LEADERSHIP 9

Understanding Team processes and Team Coaching; Team decision making and conflict management; Virtual teams; Managing Multicultural teams; Building great teams. Experiential Learning; Action Learning; Development Planning: GAP Analysis; Coaching and Mentoring; Women in Leadership Roles.

UNIT V LEADERSHIP DEVELOPMENT: THE FIRST 90 DAYS AS A LEADER 9

Building Effective Relationship with subordinates and peers; Fostering Followers satisfaction; The Art of Communication; Setting Goals and Providing Constructive Feedback; Enhancing Creativity problem solving skills. Building High-Performance Teams: The Rocket Model; Building Credibility and Trust; Skills for Developing. Others; Team Building at the Top; Community Leadership.

TOTAL: 45 PERIODS

OUTCOMES:

On Successful completion of this course, the students will be able to:

- Access global leadership skills contribute to leadership effectiveness.
- Study the leader's role in team-based organizations.
- Illustrate the potential contribution of outdoor training to the development of team leadership.
- Obtain the basics of leadership during a crisis.
- Analyze how evidenced based leadership can contribute to contingency and situationalleadership.

TEXT BOOKS:

1. Leadership: Enhancing the lessons of experience by Hughes, R.L., Ginnett,

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

24CE202PE	SAFETY AND RISK ANALYTICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

The students should be made to

- Educate overview of safety and risk management in industry.
- Impart knowledge on date quality and data transformation analysis.
- Study the control charts for safety performance evaluation and analysis.
- Categorize and classify the regression analysis for the prediction of safety risk using case studies.
- Understand the statistical measures based on risk management and safety data collection.

UNIT I   INTRODUCTION TO SAFETY AND RISK MANAGEMENT   9

Hazard Triangle - Safety ontology - Quality risk assessment - Hazard and risk data- I & II - Incident Investigation data - Inspection and audit data - Behavioral and organizational safety data.

UNIT II   DATA QUALITY AND DISCRIPTIVE ANALYTICS   9

Data dimensions and information quality - Missing data handling - Data transformation - Data reduction - Probability distribution - sample and statistics - Safety data visualization tools - safety data exploration.

UNIT III   SAFETY PERFORMANCE AND ANALYSIS   9

Leading and lagging indicators for measuring safety performance - control charts for safety performance evaluation and monitoring - safety capability analysis - Safety reports and use of text analytics - Processing of text data - Document classification using KNN - Topic modeling - Latent Dirichlet allocation.

UNIT IV   PREDICTIVE ANALYTICS   9

Bow - Tie construction – Bow-tie quantification - accident scenarios, paths - Probabilistic approach using Monte Carlo Simulation - Consequence Modeling and Risk distribution - Introduction to predictive safety and risk analytics - Logistic regression -Application of logistic regression -

CHAIRMAN
BoS(CIVIL)

Classification and regression tree, case study - Support vector machine - Applications - Association rule mining – applications.

UNIT V   STATISTICAL MEASURES   9

Statistical measures of safety program effectiveness - Intervention design – Risk based decision making - Risk based maintenance - Behavioral safety data collection and preliminary analysis - Causal modelling and application path - Injury epidemiology - Occupational safety, Health and working conditions code & analytics.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On successful completion of this course, the students will be able to:

- Develop safety measures policy in industries based on Indian regulations.
- Explore the date quality and data transformation system.
- Apply safety performance measures and control measures in working environments.
- Predict analysis for preparation of Emergency Plans and Accident investigation.
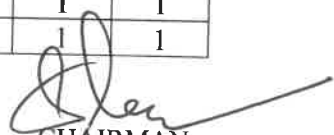- Analyse safety management system and measures.

TEXT BOOKS:

1. H Kumamoto and E J Henley, "Probabilistic Risk Assessment and Management for Engineers and Scientists", IEEE Press, 2nd Edition, 2000.

REFERENCES:

1. Daniela witten. Trevor Hastie, Robert Tibshirani, Gareth James "An Introduction to Statistical Learning", Springer Book, 2013.
2. Tan, P. N., Steinbach, M., & Kumar. V, "Introduction to Data Mining", Pearson Education India, 2016.

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS(CIVIL)

24CE301PE   **SUSTAINABLE AND LEAN CONSTRUCTION**   **L   T   P   C**

                                                              3   0   0   3

OBJECTIVES:

The student should be made to:

- Impart knowledge about sustainable construction
- Understand the concepts and components of energy calculations
- Perform the role of properties of construction materials in green buildings
- Analyze the need, measurement and improvement in concepts of lean
- Execute the Lean construction tools and techniques in the project site

UNIT I   INTRODUCTION & MATERIALS USED IN SUSTAINABLE
**   CONSTRUCTION   9**

Introduction and definition of Sustainability - Carbon cycle - role of construction material: concrete and steel, etc. - CO_2 contribution from cement and other construction materials - Recycled and manufactured aggregate - Role of QC and durability - Life cycle and sustainability.

UNIT II   ENERGY CALCULATIONS   9

Components of embodied energy - calculation of embodied energy for construction materials - Energy concept and primary energy - Embodied energy via-a-vis operational energy in conditioned building - Life Cycle energy use.

UNIT III   GREEN BUILDINGS   9

Control of energy use in building – National Building Code (NBC), ECBC code, codes in neighboring tropical countries - OTTV concepts and calculations – Features of LEED and TERI – Griha ratings - Role of insulation and thermal properties of construction materials - influence of moisture content and modeling -Performance ratings of green buildings - Zero energy building'

UNIT IV   CORE CONCEPTS IN LEAN   9

Introduction to the Course; Lean Overview; Need for Productivity Measurement and improvement; Productivity Measurement System (PMS).

CHAIRMAN
BoS (CIVIL)

Sampling/ Work Sampling; Survey/ Foreman delay survey; Value Stream/ Process Mapping–5S, Collaborative Planning System (CPS)/ Last Planner System (LPS) – Big Room Approach, IT/BIM and Lean, How to Start Practicing Lean Tools in Project Site.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On completion of the course, the student will be able to:

- Describe the various sustainable materials used in construction.
- Explain the method of estimating the amount of energy required for building.
- Describe the features of LEED, TERI and GRIHA ratings of buildings.
- Explain the core concepts of lean construction tools and techniques and their importance in achieving better productivity.
- Apply lean tools & techniques to achieve sustainability in construction projects.

TEXT BOOKS:
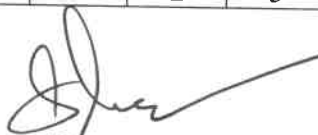
1. Charles J Kibert, Sustainable Construction: Green Building Design & Delivery, 4th Edition, Wiley Publishers 2016.
2. Steve Goodhew, Sustainable Construction Process, Wiley Blackwell,UK, 2016.

REFERENCES:

1. Craig A. Langston & Grace K.C. Ding, Sustainable Practices in the Built Environment, Butterworth Heinemann Publishers, 2011.
2. Ballard, G., Tommelein, I., Koskela, L. and Howell, G., Lean construction tools and techniques, 2002.
3. Salem, O., Solomon, J., Genaidy, A. and Luegring, M., Site implementation and Assessment of Lean Construction Techniques, Lean Construction Journal, 2005.

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

24CE302PE	MUNICIPAL SOLID WASTE MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

The students should be made to:

- Understand characteristics of solid waste to enhance sustainable interpreted management.
- Gain skills on onsite storage and processing.
- Infer analysis of collection system to transfer stations.
- Outline offsite processing techniques under Indian conditions.
- Interpret safe disposal techniques to promote suitable urban development.

UNIT I   SOURCES AND TYPES   9

Sources and types of municipal solid wastes-Waste generation rates-Factors affecting generation, characteristics-methods of sampling and characterization - Effects of improper disposal of solid wastes-Public health and environmental effects- Elements of solid waste management –Social and Financial aspects – Municipal solid waste (M&H) rules – sustainable integrated Management-Public awareness; Role of NGOs.

UNIT II   ON-SITE STORAGE AND PROCESSING   9

On-site storage methods – Effect of storage, materials used for containers – Segregation of solid wastes – Public health and economic aspects of open storage – Waste segregation and storage – Case studies under Indian conditions – Source reduction of waste – Reduction - Reuse and Recycling - Methods of Residential and commercial waste collection – Collection vehicles – Manpower– Collection routes – Analysis of collection systems -Transfer stations – Selection of location, operation & maintenance -Options under Indian conditions – Field problems-solving.

UNIT III   ANAEROBIC DIGESTION   9

Anaerobic Digestion - Definition - concept of anaerobic digestion - Importance in waste management and renewable energy - Types of organic wastes suitable for AD (municipal, industrial, agricultural, animal manure) - Historical development and global scenario of AD technology

CHAIRMAN
BoS (CIVIL)

UNIT IV   OFF-SITE PROCESSING   9

Objectives of waste processing - Physical Processing techniques and Equipment's - Resource recovery from solid waste composting and bio methanation- Thermal processing options - Case studies under Indian conditions.

UNIT V   DISPOSAL   9

Land disposal of solid waste - Sanitary landfills – Site selection - Design and operation of sanitary landfills – Landfill liners – Management of leachate and landfill gas- Landfill bioreactor– Dumpsite Rehabilitation.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to:

- Identify the types and sources of municipal solid waste.
- Understand concepts of waste minimization, reuse, recycling and waste exchange.
- Illustrate various techniques for handling, storage and segregation of wastes at source.
- Compare various waste processing technologies including biological, chemical and thermal techniques.
- Describe design, operation of different types of sanitary landfills.

TEXT BOOKS

1. George Tchobanoglouset.al., "Integrated Solid Waste Management", McGraw-Hil Publishers, 1st Edition, 2014.
2. P. Jayarama Reddy, "Municipal Solid Waste Management", CRC Press, 1st Edition, 2024.

REFERENCES:

1. A.D. Bhide & B.B. Sundaresan "Municipal Solid Waste Management" New Age International ,2021.
2. S.K. Singh & Sandeep Singh, "Solid Waste Management", Katson Publishing,2021.
3. Anne Scheinberg et al., "Municipal Solid Waste Management in Developing Countries", Routledge,2020.

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

24CE303PE   **WASTEWATER TREATMENT AND RECYCLING**   L   T   P   C

                                                              3   0   0   3

OBJECTIVES:

The students should be made to:

- Understand wastewater sources, characteristics, treatment concepts, and management principles.

- Explain pollutant attenuation and fundamental wastewater treatment processes effectively.

- Recognize biological wastewater treatment processes and related microbial mechanisms.

- Describe sludge management and advanced wastewater treatment process applications.

- Analyze modern wastewater treatment, recycling technologies, and decision-making approaches.

UNIT I   WASTEWATER MANAGEMENT   9

Introduction to wastewater - Various sources and types of wastewater - Need of wastewater management - Concept of wastewater treatment and recycling - Wastewater Generation and Characteristics - Wastewater generation and quantity estimation - Water quality parameters and standards (COD, BOD, DO, Solids, Nutrients, metals and emerging contaminants) - Sources specific wastewater physical and chemical characteristics.

UNIT II   TREATMENT PROCESSES   9

Natural Attenuation of Pollutants in Wastewater - Concept of natural attenuation - Wastewater discharge in rivers - Attenuation of pollutants on land application & Treatment Philosophy - Objectives of wastewater treatment - Concept of mass balance - kinetics and equilibrium processes - Reactors tanks - Continuously mixed tank reactors - Plug-flow reactors Introduction to primary, secondary and tertiary treatment & Preliminary and Primary Treatment Processes – Screening - Grit removal - Equalization tank - Sedimentation theory - Rectangular and circular sedimentation tanks.

CHAIRMAN
BoS (CIVIL)

UNIT III   BIOLOGICAL TREATMENT   9

Secondary Treatment Processes - Biological treatment of wastewater - Microbial ecology and growth kinetics - Types of microorganisms - Aerobic and anaerobic processes - Suspended and attached growth systems - Activated sludge process - Tricking filters and Rotating biological contactors - Secondary Treatment Processes – Anaerobic - Anaerobic treatment - Anaerobic decomposition of organic matter - Fluidized bed systems - Upflow anaerobic sludge blanket systems - Biogas production and collection - other reactor configurations

UNIT IV   SLUDGE MANAGEMENT   9

The quantity and characteristics of sewage sludge - Sludge dewatering – drying and thickening - Sludge digestion - Aerobic and anaerobic sludge stabilization - Composting - Tertiary (Advanced) Treatment Processes - Need and Objectives of advanced treatment - Nutrient (N and P) removal - Chemical treatment processes - Advanced oxidation processes - Adsorption and Ion-exchange - Membrane processes.

UNIT V   WASTEWATER RECYCLING   9
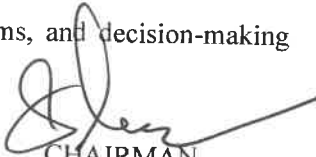
Current Treatment Approaches - Conventional systems; Integrated treatment systems - Advanced reactor configurations - SBR, MBR and MBBR - Application and case studies - Wastewater Recycling - Scope and demands - Types and stages of recycling - Recycling requirements - Designated reuse criteria - centralized vs decentralized recycling systems - Technology Selection and Decision Making - Research trends in wastewater treatment and recycling - Choice modelling and decision making - Risks and challenges - Socio-economic perspectives - Case studies

TOTAL: 45 PERIODS

OUTCOMES:

On Successful completion of this course, the students will be able to,

- Identify and classify wastewater sources, characteristics, treatment concepts, and management strategies.

- Demonstrate understanding of pollutant attenuation mechanisms and fundamental wastewater treatment processes.

- Apply knowledge of biological treatment processes and microbial mechanisms in wastewater management.

- Evaluate sludge management techniques and advanced treatment process applications.

- Assess modern wastewater treatment technologies, recycling systems, and decision-making methodologies.

CHAIRMAN
BoS (CIVIL)

TEXT BOOKS:

1. Metcalf & Eddy, "Wastewater Engineering: Treatment and Resource Recovery", Mc Graw Hill, New Delhi, 5th Edition, 2013

2. Ronald Droste and Ronald Gehr, "Theory and Practice of Water and Wastewater Treatment", John Wiley & Sons, 2nd Edition, 2018.

REFERENCES:

1. Lawler and Benjamin, "Water Quality Engineering: Physical / Chemical Treatment Processes", John Wiley & Sons, Noida, 1st Edition, 2013.

2. Bhandari and Ranade, "Industrial Wastewater Treatment, Recycling and Reuse", Elsevier, 1st Edition, 2014

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

24CE304PE   **AIR POLLUTION AND CONTROL ENGINEERING**   L   T   P   C
                                                                    3   0   0   3

OBJECTIVES:

The students should be made to:

- Understand characteristics, sources and effects of major air pollutants.
- Outline meteorological parameters, and dispersion models to predict and concentration of air pollutants.
- Infer techniques and instrumentation used for particulate control.
- Interpret various equipment and processes used to control gaseous contaminants from industries and automobiles.
- Develop air quality management strategies.

UNIT I   AIR POLLUTION SOURCES AND EFFECTS   9

Definitions – Scope - Significance and Episodes - Air Pollutants - Classifications- Natural and Artificial - Primary and Secondary - Sources of air pollution - Stationary and mobile sources - Effects of Air pollutants on humans - Materials and vegetation - Global effects of air pollution - Green House effect - Heat Islands - Acid Rains - Ozone Holes.

UNIT II   METEOROLOGY AND PLUME DISPERSION   9
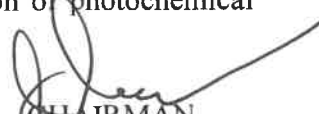
Properties of atmosphere- Temperature - Pressure and Wind forces - Influence of Meteorological phenomena on Air Quality - Temperature lapse rates and Atmospheric Stability - Wind velocity and turbulence - Plume behaviour - Wind rose diagrams - Dispersion theories and models - stack height - Plume rise.

UNIT III   AIR POLLUTION CONTROL METHODS   9

Source correction methods - Raw material changes, Process Changes and Equipment modifications, Particulate control equipments - Settling Chambers, Centrifugal separators, Fabric filters Wet scrubbers and Electrostatic precipitators. Collection efficiency and design problems. General Methods of Control of Gaseous emissions- Absorption, Adsorption and Combustion. Control of NOx and SOx emissions.

UNIT IV   AIR POLLUTION DUE TO INDUSTRIES AND AUTOMOBILES   9

Air pollution from major industrial operations - Mining and mineral processing - Cement manufacturing - Petroleum refinery - Metallurgical operations - Thermal power plants - Air Pollution due to Automobiles - Emissions from automobiles - Formation of photochemical smog – Combustion - Air-Fuel ratio - Control of Exhaust emissions.

CHAIRMAN
BoS (CIVIL)

Ambient Air Sampling - Sampling procedures for collection of gases - Particulates - High Volume Sampler - Stack monitoring- Sampling Techniques for Stack gases - Analysis of Air Pollutants - SOx, NOx, CO, Hydrocarbons - Particulate matter - Air quality standards - Emission standards.

TOTAL: 45 PERIODS

OUTCOMES:

On Successful completion of this course, the students will be able to:

- Explain the sources, types, and global effects of air pollution and their impact.
- Extend meteorological parameters and plume dispersion processes affecting air quality.
- Demonstrate pollution control methods and efficiency of particulate and gaseous emission control devices.
- Examine industrial and automobile pollution characteristics and exhaust emission control techniques.
- Analyse sampling and monitoring techniques for assessment of air quality.

TEXT BOOKS:

1. Jeff Kuo, Air Pollution Control Engineering for Environmental Engineers, CRC Press,2019.
2. Rao M N and Rao H.V.N., "Air Pollution Control", 1st Edition, Tata-McGraw-Hill., New Delhi, 2017.

REFERENCES:

1. Kenneth C. Schifftner, Air Pollution Control Equipment Selection Guide (3rd Edition),, CRC Press,2021.
2. Daniel A. Vallero, Fundamentals of Air Pollution (6th Ed.), Academic Press,2025.
3. Qiang Wang & Ahmad Hosseini-Bandegharaei, Prevention of Air Pollution, Springer Cham,2025.

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

24CE305PE	ENVIRONMENTAL IMPACT ASSESSMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

The students should be made to:

- Understand the practical application of EIA concepts through real-life case studies.
- Infer assessment techniques and environmental impacts of major development projects.
- Outline methodology and stages involved in conducting an EIA of different sectors.
- Interpret Environmental monitoring and Management Plans (EMP).
- Develop effectiveness of EIA reports and decision making processes based on field examples.

UNIT I   INTRODUCTION TO EIA   9

Environmental Impact Assessment (EIA) - Environmental Impact Statement - Environmental Risk assessment -Legal and Regulatory aspects in India - Types and limitations of EIA - Terms of reference in EIA - Issues in EIA - National - Cross sectoral - social and cultural.

UNIT II   ASSESSMENT TECHNIQUES IN EIA   9

Components - screening - setting - analysis - Prediction of impacts – mitigation - Matrices - Networks - Checklists - Importance assessment techniques - Cost benefit analysis - Analysis of alternatives - methods for prediction - assessment of impacts - air - water - soil - noise - biological - cultural - social - economic environments.

UNIT III   EVALUATION OF EIA   9

Standards and guidelines for evaluation public participation - Environmental decision - Making trends in EIA practice - Evaluation criteria – capacity building for quality assurance - Expert system in EIA - use of regulations and AQM.

UNIT IV   IMPACT IDENTIFICATION METHODS   9

Document planning - collection and organization of relevant information - use of visual display materials team writing - reminder checklist- Environmental monitoring - guidelines - policies - planning of monitoring programmes - Environmental management plan - Post project audit.

CHAIRMAN
BoS (CIVIL)

UNIT V   CASE STUDIES OF EIA

Case studies of Industrial and other EIA projects - Brief introduction about Environment legislation - Environmental Audit - Practical applications of EIA methodologies.

TOTAL: 45 PERIODS

OUTCOMES:

On Successful completion of this course, the students will be able to:

- Explain the concepts, legal aspects, types, issues and limitations of EIA.
- Demonstrate suitable assessment techniques in EIA.
- Summarize standards and guidelines foe evaluation of EIA.
- Develop polices, Planning of environmental management plan.
- Analyse practical case studies and interpret environmental legislation and auditing practices.

TEXT BOOKS:

1. M. Anji Reddy, "Environmental Impact Assessment: Theory and Practice", BS Publications, 1st Edition, 2022.
2. Ravi Jain, L. Urban, Gary Stacey and Harold Balbach, "Environmental Assessment" McGraw Hill, 2nd Edition, 2001.

REFERENCES:

1. R. Rajagopalan, "Environmental Impact Assessment", Oxford University Press, 2021.
2. M. Anji Reddy, "Textbook of Environmental Impact Assessment", BS Publications, 2020.
3. J.G. Ghose, "Environmental Impact Assessment and Management", University Science Press, 2019.

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

24CE306PE	HAZARDOUS WASTE MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

The students should be made to:

- Recall sources and need for scientific management of sustainable hazardous waste.
- Learn collection, segregation and transfer logistics in hazardous waste systems.
- Understand characteristics, generation rates and minimization strategies of hazardous solid waste.
- Infer modern methods of Bio medical waste processing, composting and energy recovery techniques.
- Outline characteristics, recycling of E-waste.

UNIT- I   HAZARDOUS WASTE   9

Hazardous waste definition - Physical and biological routes of transport of hazardous substances- sources and characterization - Sampling and analysis of hazardous wastes-proximate analysis- survey analysis - directed analysis- handling- collection- storage and transport.

UNIT- II COLLECTION, SEGREGATION AND TRANSPORT   9

Handling and segregation-Collection and storage of solid wastes-analysis of Collection Systems-Transfer stations, labelling and handling of hazardous wastes-Solid waste processing technologies-Mechanical and thermal volume reduction-Biological and chemical techniques for energy and other resource recovery-composting-types-vermicomposting-termigradation, fermentation

UNIT- III   HAZARDOUS WASTE MANAGEMENT   9

Hazardous waste treatment technologies -TSDF concept-Physical-chemical and thermal treatment of hazardous waste-solidification-chemical fixation- encapsulation- pyrolysis and incineration-Hazardous waste landfills-Site selections-design and operation-HW reduction-recycling and reuse-Regulatory aspects of HWM/HWM rules.

UNIT- IV   BIOMEDICAL WASTE MANAGEMENT   9

Classification- collection-segregation treatment and disposal-Radioactive waste-definition- low level - high level radioactive wastes and their management-radiation standards.

UNIT- V   E-WASTE MANAGEMENT   9

Waste characteristics-generation-collection- transport and disposal- regulatory aspects of e waste- global strategy-recycling.

TOTAL 45 PERIODS

CHAIRMAN
BoS (CIVIL)

OUTCOMES:

On Successful completion of this course, the students will be able to,

- Explain sources, sampling and analysis of hazardous wastes
- Illustrate the handling and segregation, collection and storage of solid wastes.
- Summarize the physical, chemical and thermal treatment of hazardous waste
- Develop segregation treatment and disposal of bio medical waste
- Categorize the collection methods, transport and disposal of e waste

TEXT BOOKS:

1. Cliff Van Guilder, "Hazardous Waste Management", Mercury Learning and Information; 2nd Edition, 2028.
2. Cherry PM, "Solid and Hazardous Waste Management", CBS Publishers and Distributors Pvt Ltd , 2017.

REFERENCES:

1. Sudha Goel, Advances in Solid and Hazardous Waste Management (2nd Ed.), Springer Cham,2024.
2. Zarook Shareefdeen, Hazardous Waste Management: Advances in Chemical and Industrial Waste Treatment and Technologies, Springer Cham,2022.
3. Rajesh Banu Jeyakumar et al., Hazardous Waste Management, IntechOpen,2022.

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

24CE401PE	INTELLIGENT TRANSPORTATION SYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES:

The student should be made to:

- Understand roles and responsibilities of Intelligent Transportation Systems.
- Learn about ITS architecture, framework and its associated hardware components.
- Infer advanced transport management strategies.
- Interpret traveler information systems, route guidance, and real-time data dissemination methods.
- Outline advanced automated highway systems.

UNIT I   INTRODUCTION TO INTELLIGENT TRANSPORT SYSTEM   9

Introduction to Intelligent Transportation Systems (ITS) -Definition - Role and Responsibilities - Advanced Traveller Information System – Fleet Oriented ITS Services - Electronic Toll Collection -Critical issues -Security - Safety

UNIT II   ITS ARCHITECTURE AND HARDWARE   9

Architecture - ITS Architecture Framework - Hardware Sensors - Vehicle Detection - Techniques - Dynamic Message Sign -GPRS - GPS - Toll Collection

UNIT III   ADVANCED TRANSPORT MANAGEMENT SYSTEM   9

Video Detection - Virtual Loop - Cameras - ANPR - IR Lighting - Integrated Traffic Management - Control Centre - Junction Management Strategies- ATMS - Advanced Traveler Information Systems (ATIS)- Route Guidance - Issues -Historical - Current -Predictive Guidance - Data Collection -Analysis -Dynamic Traffic Assignment (DTA) - Components - Algorithm.

UNIT IV   ADVANCED TRAVELLER AND INFORMATION SYSTEM   9

Travel Information - Pre Trip and Enroute Methods- Basic ATIS Concepts - Smart Route System -Data Collection - Process - Dissemination to Travelers - Evaluation of Information - Value of Information - Business Opportunities.

CHAIRMAN
BoS (CIVIL)

UNIT V   CASE STUDIES

Automated Highway Systems - Vehicles in Platoons - Integration of Automated Highway Systems. ITS Programs in the World - Overview of ITS implementations in developed countries, ITS in developing countries- Advancements in recent technologies.

TOTAL: 45 PERIODS

OUTCOMES:

On Successful completion of this course, the students will be able to:

- Explain Intelligent Transportation Systems and their importance in traffic management.
- Interpret ITS architecture and describe various hardware components.
- Summarize advanced integrate transport management strategies.
- Apply concepts of advanced traveler information systems to design real-time information dissemination for users.
- Analyze real-world ITS implementations and case studies, identifying critical issues and best practices for deployment.

TEXT BOOKS:
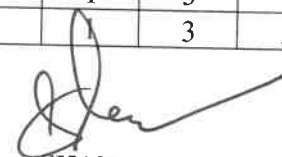
1. Pradip Kumar Sarkar and Amit Kumar Jain, "Intelligent Transport Systems", PHI Learning, 2018.
2. Mashrur Chowdhury and Adel Sadek, "Fundamentals of Intelligent Transportation Systems Planning", Artech House, USA, 1st Edition, 2003.

REFERENCES:

1. Rajeshwar S. Bhandari, "Intelligent Transportation Systems", Khanna Book Publishing, 2019.
2. Mashrur Chowdhury and Adel Sadek, "Fundamentals of Intelligent Transportation Systems Planning", Artech House, USA, 2nd Edition, 2013.
3. Indian Roads Congress (IRC) Specifications, Guidelines and Special Publications on ITS, latest editions.

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

24CE402PE **URBAN TRANSPORTATION SYSTEMS** **L T P C**

3 0 0 3

OBJECTIVES:

The student should be made to:

- Understand the various components of metro systems and their planning for different disciplines.
- Learn the concepts of elevated and underground metro station design and construction.
- Gain knowledge about contracts and quality management systems in metro projects.
- Acquire skills in analyzing and designing metro station components using relevant codes and software.
- Explore advanced construction technologies, load combinations, and modeling methods for metro projects.

UNIT I **INTRODUCTION TO MASS RAPID TRANSIT SYSTEM** **9**

Overview of Metro - Transit Oriented Development -Feasibility study for MRTS projects - Sustainable and smart technologies - Recent advancements and future technologies (High Speed Rail Technology, Maglev & Ground Effect Trains etc.) – Metro Transportation- Mono Rail – Bus Rapid Transport System (BRTS) – Hyperloop – Bullet Train

UNIT II **PLANNING AND MANAGEMENT SYSTEM OF METRO** **9**
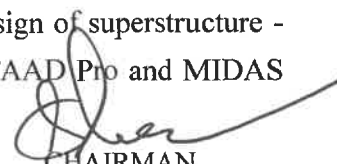
Basic Interfacing Principles - Alignment, urban level planning, constraints and restrictions - Building Information Modeling in Metros - HVAC systems - Tunnel Ventilation System- Public Health engineering – Fire alarm system - Introduction to contracts - Overview of FIDIC standards - Introduction to quality systems - knowledge check.

UNIT III **CONSTRUCTION TECHNOLOGY** **9**

Precasting yard development - Types of precast super structure – Precast Mould development -Formwork system overview - Introduction to precast erection - Superstructure launching methods - Obligatory spans - Substructure and foundation construction methodology - Challenges in foundation construction - Substructure system – Choosing type of pier based on alignment profile, Rail / over head equipment mast - Station overall layout -Pier arm - Spine wing / cantilever and platform -Precast / cast-in-situ system.

UNIT IV **ELEVATED DESIGN OF STATION AND VIADUCT** **9**

Overview of elevated station - Analysis and design -Spine beam method - Design of station components, loads - Introduction to IRC/IRS codes - Analysis and design of superstructure - Substructure and foundation - Introduction to modeling software - STAAD Pro and MIDAS Civil - Ductile detailing of structures.

CHAIRMAN
BoS (CIVIL)

Underground station and its configuration - Shoring systems - Supporting systems - Construction methodology (Bottom-Up method / Top down method) - Earth retaining structures - Secant pile wall design -Guide walls - Introduction to loads - Load combinations - Fire resistant criteria and floatation check -2D & 3D model generation -SOD restrictions & Element sizing for UG stations - Design of all the components of UG station.

TOTAL: 45 PERIODS

OUTCOMES:

On Successful completion of this course, the students will be able to,

- Identify the various components of metro and its planning for various disciplines.
- Develop a conceptual layout of elevated and underground metro station.
- Design diaphragm wall for the construction of underground metro station.
- Understand contracts systems and quality systems in metro engineering.
- Apply different load combinations model generation using software.
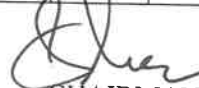
TEXT BOOKS:

1. Dinesh Mohan and Geetam Tiwari, " Transport Planning and Traffic Safety", CRC Press,1st Edition, 2016.
2. S. C. Saxena and S. P. Arora, "A Textbook of Railway Engineering", Dhanpat Rai Publications, New Delhi, 2024.

REFERENCES:

1. Vukan R. Vuchic, "Urban Transit Systems and Technology", Wiley, New Jersey, 2017.
2. J. G. S. Maheshwari, "Metro Rail Construction Technology", Khanna Publishers, New Delhi, 2019.
3. Indian Roads Congress (IRC) and Indian Railway Standards (IRS) codes and guidelines, latest editions.

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

24CE403PE	BRIDGE ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

The student should be made to:

- Understand the various functions, components, and importance of bridges in transportation systems and infrastructure.

- Infer bridge superstructure characteristics under different load conditions.

- Gain skills to design truss bridges and plate girder bridges.

- Familiarize with the design methodologies for reinforced concrete (RC) and prestressed concrete (PSC) bridges, including slab bridges.

- Outline design and functionality of substructures bearings and expansion joints in bridge construction.

UNIT I   GENERAL CONSIDERATIONS FOR ROAD BRIDGES   9

Introduction - Site selection - Soil exploration for site - Selection of bridge type – Economical span - Number of spans - Determination of HFL - General arrangement drawing – Introduction to Handbook.

UNIT II   SUPERSTRUCTURES   9

Bridge decks - Structural forms and behavior -Choices of superstructure types - Behavior and modeling of bridge decks - Simple beam model - Plate model - Grillage method - Finite element method - Different types of superstructure (RCC and PSC) -Longitudinal analysis of bridge- Transverse analysis of bridge - Temperature analysis - Distortional analysis - Effects of differential settlement of supports - Reinforced earth structures.

UNIT III   DESIGN OF STEEL BRIDGES   9

Design of Truss Bridges - Design of Plate girder bridges.

UNIT IV   DESIGN OF RC AND PSC BRIDGES   9

Design of slab bridges - T beam bridges - PSC bridges.

CHAIRMAN
BoS (CIVIL)

UNIT V SUBSTRUCTURE, BEARINGS AND EXPANSION JOINTS, PARAPETS AND RAILINGS

9

Substructure -Pier -Abutment -Wing walls - Importance of soil structure interaction - Types of foundations - Open foundation - Pile foundation - Well foundation -Simply supported bridge - Continuous bridge-Different types of bridge bearings and expansion joints - Parapets and railings for highway bridges- Advancements in recent technologies.

TOTAL: 45 PERIODS

OUTCOMES:

On Successful completion of this course, the students will be able to:

- Illustrate site selection process for bridge construction.
- Interpret various types of bridge superstructures.
- Model steel bridges as per IS standards.
- Examine RC and PSC bridge design techniques.
- Analyse soil structure interaction and components of highway bridges.

TEXT BOOKS:

1. Kadiyali.L.R. "Traffic Engineering and Transportation Planning", Khanna Publishers, Delhi, 2019.

2. Kadiyali L R and Lal N B, "Principles and Practice of Highway Engineering", Khanna Publishers, New Delhi, 7th Edition, 2023.
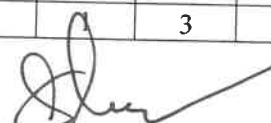
REFERENCES:

1. Wolfgang S.Homburger et al., "Fundamentals of Traffic Engineering" 15th Edition, Institute of Transportation Studies, Universities of California, 2012.

2. Fred L Mannering and Scott S Washburn, "Principles of Highway Engineering and Traffic Analysis", Wiley India Pvt. Ltd., New Delhi, 7th Edition, 2019.

3. Garber Nicholas J and Hoel Lester A, "Traffic and Highway Engineering", Cengage Learning, 5th Edition (Enhanced Edition), 2020.

IS CODES:

- IRC:6-Standard Specifications and Code of Practice for Road bridges
- IRC:78- Code of Practice for Road bridges (Foundations and substructure)
- IRC: SP:13- 2022- Small Bridges and culverts
- IRC 112: Code of Practice for concrete road bridges

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

24CE404PE   TRAFFIC ENGINEERING AND MANAGEMENT   L   T   P   C

                                                        3   0   0   3

OBJECTIVES:

The student should be made to:

- Understand road and road user characteristics towards sustainable approach.

- Acquire knowledge on traffic surveys and methods of measuring spot speeds.

- Learn design criteria of alignment and cross sectional elements.

- Familiarize with traffic safety measures and integration of public transportation.

- Attain skills required for traffic management, level of service and simulation of traffic.

UNIT I TRAFFIC CHARACTERISTICS   9

Road characteristics - Road user characteristics - PIEV theory - Vehicle - Performance characteristics - Fundamentals of traffic flow - Urban traffic problems in India - Integrated planning of town, country, regional and all urban infrastructure - Towards sustainable approach - Land use & transport and modal integration.

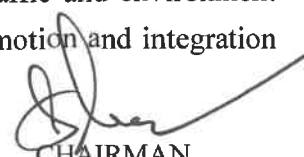## UNIT II TRAFFIC SURVEYS   9

Introduction - Use of speed - journey and delay surveys - Methods of measuring spot speeds - Vehicle volume counts - classification and occupancy - Origin and Destination survey - Parking surveys.

UNIT III GEOMETRIC DESIGN   9

Introduction - Highway classification - Traffic - Horizontal alignment - Vertical alignment - Combination of horizontal and vertical alignment - Sight distance - Cross sectional elements - Control of access - Intersection - Grade separated intersection - Bus facilities - Driveway - Design of pedestrian facilities -Design criteria for separate cycle tracks.

UNIT IV TRAFFIC SAFETY AND ENVIRONMENT   9

Road accident and safety - Causes - effect - prevention and cost - Traffic and environment hazards - Air and noise pollution - causes - abatement measures - promotion and integration of public transportation – Promotion of non-motorized transport.

CHAIRMAN
BoS (CIVIL)

Introduction - Travel demand management - Traffic management - Passenger car unit - Level of service - Capacity of urban street - Relationship between the variables - Fundamental diagram of traffic flow - Car following theory - Simulation of traffic- Advancements in recent technologies.

TOTAL: 45 PERIODS

OUTCOMES:

On Successful completion of this course, the students will be able to:

- Explain traffic characteristics and urban traffic problems in India.

- Interpret traffic surveys like speed, volume, and origin-destination surveys.

- Apply design principles for geometric elements, intersections, and pedestrian facilities.

- Develop traffic safety issues and suggest measures for accident prevention and environmental protection.

- Analyze traffic management strategies including simulation and level of service evaluation.
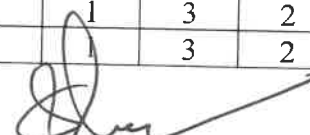
TEXT BOOKS:

1. Roger P. Roess, Elena S. Prassas, William R. McShane, "Traffic Engineering", Pearson Education, New York, 5th Edition, 2019.

2. Kadiyali, L.R., "Traffic Engineering and Transportation Planning", Khanna Publishers, New Delhi, 9th Edition, 2019.

REFERENCES:

1. Fred L. Mannering, Scott S. Washburn, "Principles of Highway Engineering and Traffic Analysis", Wiley India Pvt. Ltd., New Delhi, 7th Edition, 2020.

2. Wolfgang S. Homburger et al., Fundamentals of Traffic Engineering, Institute of Transportation Studies, University of California, 16th Edition, 2007.

3. Nicholas J. Garber and Lester A. Hoel, Traffic and Highway Engineering, Cengage Learning, USA, 5th Edition, 2014.

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

24CE405PE   **TRANSPORTATION PLANNING**   **L   T   P   C**

                                                                     3   0   0   3

OBJECTIVES:

The student should be made to:

- Understand the role of transportation in urban planning and societal concerns.

- Learn transportation planning practices and methods of travel demand estimation.

- Develop skills of trip generation and trip distribution analysis.

- Summarize mode split, and route assignment methods for transportation planning.

- Utilize land use-transportation interaction models for sustainable development.

UNIT I URBAN TRANSPORTATION PLANNING PROCESS AND CONCEPTS   9

Role of Transportation and Changing Concerns of Society in Transportation Planning - Transportation Problems and Problem Domain - Objectives and Constraints - Flow Chart for Transportation Planning Process – Inventory - Model Building - Forecasting and Evaluation Stages - Planning in System Engineering Framework - Concept of Travel Demand and its Modelling based on Consumer Behaviour of Travel Choices - Independent Variables - Travel Attributes.

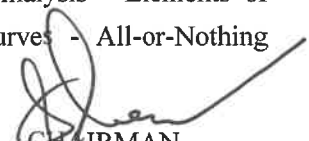## UNIT II   TRIP GENERATION ANALYSIS   9

Assumptions in Demand Estimation- Sequential, Recursive and Simultaneous Process - Introduction to Transportation Planning Practices - Definition of Study Area - Zoning.

UNIT III   TRIP DISTRIBUTION ANALYSIS   9

Trip Generation Models- Zonal Models, Category analysis - Household Models - Trip Attractions of Work Centres and Commercial Trips - Trip End and Trip Interchange Models - Trip Distribution Models - Growth Factor Models - Gravity Models - Opportunity Models and their calibration - Estimation of Travel Demand based on link volume philosophy - Entropy based Trip Distribution models.

UNIT IV   MODE SPLIT AND ROUTE SPLIT ANALYSIS   9

Mode Split Analysis - Mode Choice Behaviour - Competing Modes - Mode Split Curves - Probabilistic Models and Two Stage Mode Split Analysis - Route Split Analysis - Elements of Transportation Networks - Coding, Minimum Path Tress - Diversion Curves - All-or-Nothing Assignment - Capacity Restrained Assignment - Multipath Assignment.

CHAIRMAN
BoS (CIVIL)

Location models - Opportunity Models - Lowry based Land use -Transportation Models – Allocation Function – Constraints - Travel Demand Estimation – Iterative Solutions - Matrix Formulation - Dynamic and Disaggregated extensions - Urban Forms and Urban Structures.

TOTAL: 45 PERIODS

OUTCOMES:

On Successful completion of this course, the students will be able to:

- Explain the concepts and stages of urban transportation planning and demand modeling.

- Interpret travel demand estimation methods for urban transport systems.

- Illustrate trip generation and distribution using different modeling approaches.

- Apply mode split and route assignment techniques in transportation networks.

- Analyze land use-transportation models and their impact on urban structure.
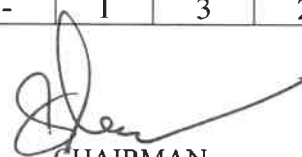
TEXT BOOKS:

1. Meyer, M. D. and Eric J. Miller, "Urban Transportation Planning: A Decision-Oriented Approach", McGraw Hill, New York, 2019.

2. Institute of Transportation Engineers (ITE), "Transportation Planning Handbook", John Wiley & Sons, New York, 4th Edition, 2016.

REFERENCES:

1. Wolfgang S. Homburger et al., "Fundamentals of Traffic Engineering", Institute of Transportation Studies, University of California, 16th Edition, 2007.

2. Fred L. Mannering, Scott S. Washburn, Principles of Highway Engineering and Traffic Analysis, Wiley (India) Pvt. Ltd., 7th Edition, 2020.

3. Garber, Nicholas J. and Hoel, Lester A., "Traffic and Highway Engineering", Cengage Learning, USA, 5th Edition, 2014.

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

24CE406PE	GEOMETRIC DESIGN OF HIGHWAY	L	T	P	C
		3	0	0	3

OBJECTIVES:

The students should be made to:

- Understand design factors, functional classification, and sight distance requirements to ensure safe and efficient road planning.

- Apply knowledge of cross-sectional elements, road furniture, and traffic signs in designing functional roadway features.

- Analyze horizontal and vertical alignment elements, curves, and safety measures for effective roadway alignment design

- Evaluate design principles for intersections and interchanges, considering safety, visibility, and operational efficiency.

- Design integrated road facilities including ramps, parking, public transport infrastructure.

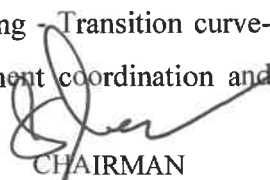| UNIT I	ROAD GEOMETRY	9

Introduction - Design factors - Functional classification of roads and Space requirements - Sight distances - Factors - Types - Sight distance under specific conditions

UNIT II	ROAD FEATURES	9

Cross-sectional elements - Profiles - Factors controlling - Common elements - Cross-sectional elements- Specific elements (bicycle and pedestrian facilities, service roads) - Categorization - Road furniture - Longitudinal markings, Junction marking - Object markings – Messages - Road Traffic Signs.

UNIT III	ROAD ALIGNMENT	9

Road Traffic signs - Road furniture- delineators - Speed breakers - Alignment -Types - Factors – Surveys - Horizontal alignment -Guiding principles - Simple circular curve - Skidding - Overturning control speeds - Superelevation - Extra-widening -Transition curve- Gradients - Vertical curves - General guidelines and types - Alignment coordination and issues.

CHAIRMAN
BoS (CIVIL)

UNIT IV   INTERSECTION DESIGN

9

Good and bad practices - Intersection - Types - Profiles - Design principles for at-grade intersections – Visibility - Attributes influencing design - Factors affecting layouts - Auxiliary lanes - Channelization and Warrants for signalized intersection - Interchanges - Types - Design principles - Warrants.

UNIT V   ROAD FACILITIES

9

Ramps -layouts - Terminals - Weaving sections – Metering - Lane balancing - Parking facilities - On-street and off-street - Supply and demand, and characteristics - Bus bays and Shelters - Truck Lay byes - Bus Rapid Transport stations and terminals - Toll Plaza layout design - Pedestrian over bridge and subway, Kilometer stone, Clearances and Access control

TOTAL: 45 PERIODS

OUTCOMES:

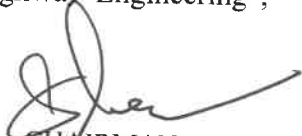On Successful completion of this course, the students will be able to:

- Explain design factors, functional classification, and sight distance requirements for safe and efficient road planning.

- Recall the concepts of cross-sectional elements, road furniture, and traffic signs to design functional roadway features.

- Examine horizontal and vertical alignment elements, curves, and safety measures for effective roadway alignment.

- Evaluate intersection and interchange designs with respect to safety, visibility, and operational efficiency.

- Plan integrated road facilities including ramps, parking, and public transport infrastructure to enhance road network performance.

TEXT BOOKS:

1. Fred L. Mannering and Scott S. Washburn, "Principles of Highway Engineering and Traffic Analysis", John Wiley & Sons, Noida, 7th Edition, 2019.

2. S.K. Khanna, C.E.G. Justo & A. Veeraragavan, "Highway Engineering", Nem Chand & Bros, Uttarakhand, 10th Edition, 2021.

REFERENCES:

1. C. Jotin Khisty and B. Kent Lall, "Transportation Engineering - An Introduction", Pearson Hall India, Chennai, 3rd Edition, 2016.

2. L. R. Kadiyali and N. B. Lal, "Principles and Practices of Highway Engineering", Khanna Publishers, New Delhi, 7th Edition, 2017.

CHAIRMAN
BoS (CIVIL)

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

24CE407PE	PAVEMENT ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

The student should be made to:

- Understand types of pavements and their stress distribution.

- Gain knowledge on design concepts of flexible pavements as per IRC guidelines.

- Acquire skills on various IRC standards for the design of rigid pavements.

- Select the types of materials used for pavement construction.

- Identify stabilization, quality, and serviceability conditions of pavements as per standards.

UNIT I   PAVEMENT TYPES AND STRESS DISTRIBUTION   9

Introduction – Pavement as layered structure – Pavement types rigid and flexible – Resilient modulus – Stress and deflections in pavements under repeated loading- Introduction to Handbook.

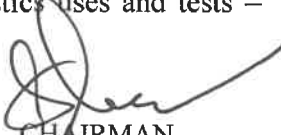**UNIT II   DESIGN OF FLEXIBLE PAVEMENTS   9**

Flexible pavement – Components and functions - Factors influencing design of flexible pavement – Design procedure as per IRC guidelines – Design and specification of rural roads – Stresses in flexible pavements.

UNIT III   DESIGN OF RIGID PAVEMENTS   9

Cement concrete pavements – Components and functions – Factors influencing design of CC pavements – Modified Westergaard approach – Design procedure as per IRC guidelines – Concrete roads and their scope in India.

UNIT IV   SUSTAINABLE PAVEMENT MATERIALS   9

Aggregates – Requirements – properties and testing – Cement grades, chemical composition, testing – admixtures – fibers – properties and testing of pavement quality concrete – Bitumen and Tar – origin – preparation – properties and chemical constitution of bituminous road binders – Bituminous emulsions and cutback – Preparation, characteristics, uses and tests – mechanism of stripping – adhesion failure.

CHAIRMAN
BoS (CIVIL)

Pavement Evaluation - Causes of distress in rigid and flexible pavements – Evaluation based on Surface Appearance, Cracks, Patches and Pot Holes, Undulations, Raveling, Roughness, Skid Resistance – Structural Evaluation by Deflection Measurements – Pavement Serviceability index – Pavement maintenance (IRC Recommendations only) – Choice of stabilizers – Testing and field control – Stabilization for rural roads in India – Use of geosynthetics in roads - Advancements in recent technologies.

TOTAL: 45 PERIODS

OUTCOMES:

On Successful completion of this course, the students will be able to:

- Summarize stress and deflections in pavements under repeated loading.
- Interpret design principles of flexible pavements as per IRC standards.
- Apply design concepts of rigid pavements as per IRC guidelines.
- Make use of quality sustainable materials for pavement construction.
- Analyze maintenance and stabilization of pavements as per highway pavement references.

TEXT BOOKS:

1. Rajib B. Mallick and Tahar El-Korchi, Pavement Engineering: Principles and Practice, CRC Press, 4th Edition, 2023.

2. Prithvi Singh Kandhal, "Asphalt Pavements: A Practical Guide to Design, Production and Maintenance for Engineers and Architects", CRC Press, 2021.

REFERENCS:

1. Yoder R.J. and Witczak M.W., "Principles of Pavement Design", John Wiley & Sons, New York, 2015.

2. Praveen Kumar and Satish Chandra, "Highway Material Testing and Quality Control", Khanna Publishers, New Delhi, 2019.

3. Indian Roads Congress (IRC) Guidelines, IRC:37-2018 – Guidelines for the Design of Flexible Pavements and IRC:58-2015 – Guidelines for the Design of Rigid Pavements.

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

PREFABRICATED STRUCTURES   L T P C
                                                                    3 0 0 3

OBJECTIVES:

The student should be made to:

- Understand the principles of serviceability, structural functionality, and the overall production cycle of prefabricated systems.
- Learn the behavior and application of different prefabricated structural elements.
- Interpret mix proportioning techniques and substitute materials for sustainable prefabrication.
- Outline various types of structural joints, their mechanism and their impact on overall performance.
- Summarize design concepts of earthquake resistant Prefabricated Structures.

UNIT I   INTRODUCTION   9

Serviceability - Functionality and durability of the building- Structural systems - Production - Modular coordination - Transportation – Erection – Introduction to Handbook.

UNIT II   PREFABRICATED ELEMENTS   9

General - Concrete sandwich panels - 3D volumetric modules - Suspended façade panels - Beams - Columns - Walls - Foundation - Floor and roof elements

UNIT III   PROPORTIONING OF MIX   9

Exposure, cover and strength - Mortars and grouts - Dry pads - Eco-friendly binders and pozzolanic materials - Substitute materials - Steel reinforcement - Rebars - Mesh - Structural steel work -Welding - Casting, fixing and lifting devices - Cast in sockets and anchorage - Non cementitious materials.

UNIT IV   JOINTS IN STRUCTURAL MEMBERS   9

Basic mechanism - Compression joints - Bearing pads - Shear joints - Shear friction - Post-tensioned joints - Tension joints - Moment resisting connection - Floor connection at load bearing walls -Flexural strength and stiffness.

UNIT V   DESIGN OF EARTHQUAKE RESISTANT CONCEPT AND CYCLONES   9

Basic concept - Geologic earthquake effects - Seismic hazard analysis - Stable foundation - Continuous load path - Adequate stiffness and strength - Seismic design categories - Design ground motion - Ductility and toughness –Cyclonic wind impact assessment.

TOTAL: 45 PERIODS

CHAIRMAN
BoS (CIVIL)

OUTCOMES:

On successful completion of this course, the students will be able to:

- Explain emerging structural innovations in Prefabricated Structures.
- Demonstrate 3D prefabricated elements with their constructional and functional details
- Make use of sustainable materials and innovative technologies in Prefabricated Systems.
- Build various types of structural joints used in prefabricated systems.
- Analyze concepts of earthquake and cyclone-resistant design in prefabricated structures ensuring adequate ductility and structural integrity

TEXT BOOKS:

1. Varghese P.C., "Building Construction", PHI Learning Pvt. Ltd., New Delhi, 2nd Edition, 2016.
2. Assed Haddad, Masa Noguchi, "Prefabricated Construction for Sustainability and Mass Customization", 2024.

REFERENCES:

1. N. Krishna Raju, "Prestressed Concrete" Tata McGraw-Hill Education, 6th Edition, 2022.
2. T.Y. Lin and Ned H. Burns, "Design of Prestressed Concrete Structure" John Wiley & Sons, New Delhi, 3rd Edition, 2010
3. P. Dayaratnam, "Prestressed Concrete Structures" Oxford & IBH Publishing.Co. Pvt,Ltd, 5th Edition, 2014.

IS CODES:

- IS15916:2020- Building Design and Erection using prefabricated concrete

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

24CE502PE	ENERGY EFFICIENT BUILDINGS	L	T	P	C
		3	0	0	3

OBJECTIVES:

The students should be made to:

- Understand fundamentals of climate-responsive design and its significance in energy efficient buildings.

- Infer knowledge of passive heating and cooling strategies.

- Explain daylighting principles and efficient lighting systems.

- Summarize thermal behavior of building envelopes and ventilation systems.

- Demonstrate climate zone wise design strategies and evaluation tools including energy audits and green building certifications.

UNIT I   CLIMATE AND BUILDING PERFORMANCE   9
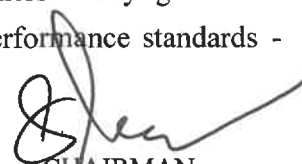
Climate responsive architecture - Classification - Climate adapted vs. climate rejecting buildings - Basics of heat transfer - conduction – convection - and radiation - Thermal mass and storage -The Greenhouse Effect – Psychrometry and thermal comfort - Microclimate and its influence - Overview of site planning and development - Orientation - wind - temperature - and humidity - Sun path diagrams and types of shading devices - Introduction to energy-conscious site planning.

UNIT II   PASSIVE STRATEGIES FOR HEATING & COOLING   9

Principles of passive solar heating and cooling - Design elements - direct gain - sunspaces - Trombe walls - thermal walls - Courtyards and roof ponds - Passive cooling techniques - natural ventilation - evaporative cooling - radiation control - wind catchers - Room organization strategies - Case studies in residential and institutional buildings - Load control and zoning - Introduction to dynamic simulations for passive design evaluation

UNIT III   DAYLIGHTING AND LIGHTING SYSTEMS   9

Daylighting fundamentals - Light sources and apertures - Light shelves and clerestories - Glazing materials and performance - Building orientation and daylighting strategies - Electric lighting integration - Lighting controls - sensors - dimmers - daylight-linked switching - Zoning and task lighting - Daylighting in codes and performance standards - Case studies highlighting daylight-energy synergy.

CHAIRMAN
BoS (CIVIL)

UNIT IV   THERMAL DESIGN & VENTILATION SYSTEMS   9

Heat gain and loss mechanisms - Building envelope and thermal insulation - Climate-responsive orientation and material selection - Mechanical and hybrid ventilation strategies - Natural ventilation design - stack and cross ventilation - Ventilation performance calculation - Indoor air quality basics - Minimum ventilation standards - Case illustrations - climate-based design adjustments.

UNIT V   CLIMATE ZONE WISE DESIGN STRATEGIES   9

Design for energy efficiency across climatic zones - Cold, Composite - Hot-Dry - Warm-Humid - Moderate climates - Passive Downdraft Evaporative Cooling - Sustainable low embodied energy materials - Strategies for residential - commercial and institutional buildings - Introduction to building performance analysis software - Basics of energy audit and green building certification systems.

TOTAL: 45 PERIODS

OUTCOMES:

On Successful completion of this course, the students will be able to:

- Interpret climate responsive and building performance strategies.

- Apply passive heating and cooling techniques including solar design elements and ventilation strategies in architectural design.

- Construct energy efficient buildings with integrate effective daylighting and lighting control systems.

- Analyze thermal performance and ventilation systems for maintaining indoor comfort and air quality.

- Examine climate appropriate buildings using energy efficient materials, tools, and certifications, tailored for various Indian climate zones.

TEXT BOOKS:

1. Brown, G.Z., & DeKay, M., Sun, Wind & Light: Architectural Design Strategies, Wiley, 3rd Edition, 2014.

2. John Krigger & Chris Dorsi, Residential Energy: Cost Savings and Comfort for Existing Buildings, Saturn Resource Management, 6th Edition, 2013.

CHAIRMAN
BoS (CIVIL)

REFERENCES:

1. Bureau of Energy Efficiency, Energy Conservation Building Code (ECBC), 2022.

2. M. Majumdar (Ed.), Energy-Efficient Buildings in India, TERI Press, 2019.

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

OBJECTIVES:

The students should be made to:

- Understand the fundamental concepts, advantages, and materials used in prestressed concrete.

- Gain knowledge of different systems and methods of prestressing and analyze prestressed concrete sections.

- Learn skills in design of prestressed concrete members for flexure, shear and deflection as per IS 1343.

- Acquire knowledge in designing continuous prestressed members.

- Apply design principles of prestressed concrete in designing miscellaneous structures.

UNIT I   THEORY AND BEHAVIOUR OF PRESTRESSED CONCRETE   9
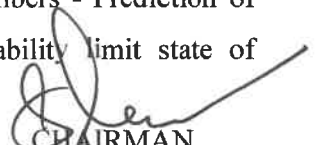
Basic concepts - Advantages- Materials required - Systems and methods of prestressing - Analysis of sections – Stress concept – Strength concept - Load balancing concept - Effect of loading on the tensile stresses in tendons – Effect of tendon profile on deflections - Factors influencing deflections - Calculation of deflections – Short term and long term deflections - Losses of prestress - Estimation of crack width – Introduction to Handbook.

UNIT II   DESIGN FOR FLEXURE AND SHEAR   9

Basic assumptions for calculating flexural stresses - Permissible stresses in steel and concrete as per IS1343 Code - Design of section for flexure - Design of sections of type I and type II post - tensioned and pre - tensioned beams - Check for strength limit state based on IS 1343 Code - Layout of cables in post-tensioned beams - Location of wires in pre-tensioned beams - Design for shear based on IS1343 code.

UNIT III   DEFLECTION AND DESIGN OF ANCHORAGE ZONE   9

Factors influencing deflections - Short term deflections of uncracked members - Prediction of long term deflections due to creep and shrinkage - Check for serviceability limit state of

CHAIRMAN

BoS (CIVIL)

deflection - Determination of anchorage zone stresses in post - Tensioned beams by Magnel's method, Guyon's method and IS 1343 code - Design of anchorage zone reinforcement.

UNIT IV   COMPOSITE BEAMS AND CONTINUOUS BEAMS   9

Types of RCC - PSC composite beams - Analysis and design of composite beams - Methods of achieving continuity in continuous beams -Analysis for secondary moments - Concordant cable and linear transformation - Calculation of stresses – Principles of design.

UNIT V   MISCELLANEOUS STRUCTURES   9

Design of tanks, pipes, poles, and compression, tension members - Use of non-prestressed reinforcement - Definition, methods of achieving, merits and demerits of partial prestressing.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to:

- Explain the basic principles, advantages, and types of prestressing systems and methods.
- Interpret design Principles of Pre tensioned and Post tensioned beams.
- Develop design concepts to Predict deflection and anchorage zone reinforcement.
- Apply Prestressing design principles in Composite and Continuous beams.
- Analyze and design of prestressed concrete structures like tanks, pipes, and poles using partial prestressing principles.

TEXT BOOKS:

1. Krishna Raju N, "Prestressed concrete", 5th Edition, Tata McGraw Hill Company, New Delhi, 2018.
2. Pandit G S and Gupta S P, "Prestressed Concrete", CBS Publishers and Distributers Pvt. Ltd., 2016.

REFERENCES:

1. Rajagopalan N, "Prestressed Concrete", Narosa Publishing House, 2nd Edition, 2017.
2. Dayaratnam P, "Prestressed Concrete Structures", Oxford and IBH, 6th Edition 2018.

CHAIRMAN
BoS (CIVIL)

IS CODES:

- IS1343:1980, Code of Practice for Prestressed Concrete, Bureau of Indian Standards, New Delhi, 2012.
- IS 3370 – 2008 (Part 4), Indian standard Code of practice for Concrete Structures for the Storage of Liquid – Design Tables, Code of Practice, Bureau of Indian Standards, New Delhi.

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

24CE504PE	DESIGN OF MASONRY STRUCTURES	L	T	P	C
		3	0	0	3

OBJECTIVES:

The student should be made to:

- Analyze concrete masonry wall in flexure, with or without axial compression;
- Understand masonry materials and properties.
- Evaluate strength and behavior of masonry under axial and eccentric compressionconditions
- Design masonry shear walls for in-plane and out-of-plane lateral loads
- Model confined masonry and various miscellaneous steel attachments to masonry

UNIT I INTRODUCTION 9

Introduction: Overview of masonry in ancient and modern times, Methods of design, codes and standards, Structural-functional requirements of masonry buildings, Classification of masonry construction and Loads- Introduction to Handbook.

UNIT II MASONRY MATERIALS AND PROPERTIES 9

Masonry materials and properties: Properties and experimental testing of components (masonry units, mortars, grout, reinforcement).

UNIT III STRENGTH AND BEHAVIOUR OF MASONRY 9
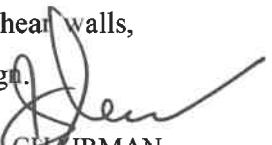
Strength and behaviour of masonry: Axial compression, eccentric compression, direct and flexural tension, shear and compression, biaxial state of stresses, P-M interaction and Deformation characteristics.

UNIT IV DESIGN OF MASONRY COMPONENTS AND SYSTEMS 9

Design of reinforced masonry: Basic principles and methods of reinforcing, working stress and limit states design, Serviceability limit states (deflection, cracking), Design for combined out-of- plane bending and axial compression, Design for in-plane flexure, Design of shear walls, Detailingrequirements, international design standards and Multi-storey building design.

CHAIRMAN
BoS (CIVIL)

Confined masonry: Development and application, Configuration, Response under seismic loads, Seismic resistance verification, Practical aspects and normative provisions. Infill masonry: Behaviour, Modelling and Design. Assessment and Strengthening of Existing Masonry Structure

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Enable overview of masonry in ancient and modern times, methods of design, codes andstandards.

- Explore properties and experimental testing of masonry units.

- Analyse biaxial state of stresses, P-M interaction and deformation characteristics inmasonry structures.

- Design masonry structures for working stress and limit state method for vertical andlateral loads, including earthquake loads.

- Review procedures for structural assessment and strengthening of existing masonrystructures.

TEXT BOOKS:

1. Drysdale, R.G., Hamid, A.A., and Baker, L.R., Masonry Structures: Behaviour and Design, The Masonry Society, 4th Edition, 2018.

2. Klingner, R E, Masonry Structural Design, McGraw-Hill Companies, 1st Edition, 2010.

REFERENCES:

1. Taly, N., Design of Reinforced Masonry Structures, Mc-Graw Hill Companies Inc., 2010.

2. TomaÅževic, M., Earthquake-resistant Design of Masonry Buildings, Imperial College Press, 1999.

3. Priestley, M.J.N. and Paulay, T., Seismic Design and Assessment of Reinforced Concrete and Masonry Buildings, John Wiley and Sons, 1997.

CHAIRMAN
BoS (CIVIL)

IS CODES:

- IS 1905 A Code of Practice for Unreinforced Masonry
- IS 2212 A Code of Practice for Brickworks
- IS 2250 A Code of Practice for masonry mortars
- IS 3314 A Code of Practice for Design and Installation of Expansion and control Joints in masonry
- SP 20:1991 A Handbook providing guidance on Masonry Design and construction based on Indian Standards

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

24CE505PE	INDUSTRIAL STRUCTURES	L T P C
		3 0 0 3

OBJECTIVES:

The student should be made to:

- Understand design, need and functional requirements of green building considerations for industries.
- Acquire skills on design considerations for lighting, ventilation, acoustics, fire safety and other services in industrial structures.
- Interpret design concepts of various steel structural elements such as roofs, crane girders, chimneys and understand their seismic detailing.
- Gain knowledge to design R.C. components in industrial buildings with considerations of all design factors.
- Apply knowledge of prefabrication, prestressing, and modular construction techniques in industrial construction

UNIT I   INDUSTRIAL BUILDING BASICS   9

Industrial building - Types -Factors affecting site selection - Roof systems - Building envelope design - Elements in industrial buildings

UNIT II   FUNCTIONAL REQUIREMENTS   9
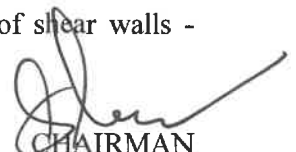
Lighting - Ventilation - Heating - ISO Standards - Staircases - Crane columns - Bracings - Longitudinal and transverse directions - Fire safety design and Egress planning.

UNIT III   DESIGN OF STEEL STRUCTURES   9

Industrial roofs - Crane gantry girders - Design of bunkers and silos - Types of steel chimneys - Steel frame connections.

UNIT IV   DESIGN OF R.C. STRUCTURES   9

Design of R.C. members for fire resistance - Deep beams - Design - Design of shear walls - Design for vibration control in R.C. structures.

CHAIRMAN
BoS (CIVIL)

Construction of precast segments - Cast in-situ construction - Prestressed concrete truss - Folded plates - Prefabricated modular systems - Advancements in recent technologies.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to:

- Interpret types and components of industrial buildings and modern industrial layout.
- Demonstrate functional requirements in industrial structures as per IS standards.
- Make use of design criteria's and seismic detailing in steel structures.
- Apply design concepts in R.C. structural elements like shear walls, deep beams and flat slabs with fire and vibration resistance.
- Analyze prefabrication and modular methods in construction of industrial components using modern techniques.
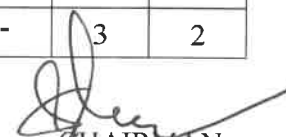
TEXT BOOKS:

1. Ashoke Kumar Dasgupta., "Design of Industrial Structures", CRC Press, 1st Edition, 2021
2. Varghese, P.C. "Advanced Reinforced Concrete Design", PHI Learning Pvt. Ltd., 2018.

REFERENCES:

1. Bungale S. Taranath – Structural Analysis and Design of Tall Buildings: Steel and Composite Construction, CRC Press, 2016.
2. Handbook on Functional Requirements of Industrial Buildings – Central Public Works Department (CPWD), Govt. of India.
3. Kim S. Elliott – Precast Concrete Structures, Butterworth-Heinemann, 2nd Edition, 2016.
4. Mehta & Monteiro – Concrete Microstructure, Properties, and Materials, McGraw Hill, 2014.

Mapping of Cos with POs and PSOs:

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

CHAIRMAN
BoS (CIVIL)

24CE506PE **MAINTENANCE AND REPAIR OF CONCRETE**   L   T   P   C

STRUCTURES   3   0   0   3

OBJECTIVES:

The students should be made to:

- Learn concepts of embedded metal corrosion, its significance, types, assessment quality on TMT and corrosion in prestressed concrete.

- Determine deterioration in cementitious systems under various exposure conditions using different onsite tests.

- Evaluate assessment and protective treatment of rebars

- Execute coating and strengthening on concrete structures, structural strength in joints and connections.

- Develop skills on service life estimation studies with various case studies

UNIT I   **EMBEDDED METAL CORROSION**   9

Prologue - Corrosion of embedded metal - Significance and fundamentals of corrosion - carbonation induced and chloride - Induced corrosion - Corrosion of embedded metal - Types of reinforcement - Bare steels - TM ring test for assessing the quality of TMT / QST steel rebars - Metallic and nonmetallic coated rebars - Corrosion in prestressed concrete- Introduction to Handbook

UNIT II   **DETERIORATION IN CEMENTITIOUS SYSTEMS AND TESTING**   9

Deterioration of cementitious systems - Introduction - Sulphate attack, biofouling and acid attack - Frost attack freeze - Thaw and alkali - Silica reaction - Shrinkage and creep - Fire attack - Abrasion and erosion -Condition assessment of concrete structure - Exposure conditions - Visual inspection -Onsite concrete testing - Testing of concrete in laboratory.

UNIT III   **ASSESSMENT AND PROTECTIVE TREATMENT**   9

Assessment of concrete structure - Mechanical and corrosion testing of rebars - Strategies and materials for surface repair - Surface preparation and protective treatment.

CHAIRMAN
BoS (CIVIL)

UNIT IV   COATING AND STRENGTHENING   9

Coatings on concrete infrastructure - Water proofing of concrete structures - Structural strengthening & stabilization - Load effects and introduction to S&S - Beams and slabs - Column & walls - Structural strengthening (joints and connections) - Injection grouts for concrete repair - Structural repair for prestressed concrete systems

UNIT V   SERVICE ESTIMATION AND CASE STUDIES   9

Case studies on structural repair (right methodologies and systematic approach / case studies) - cathodic protection in concrete structures - Laboratory and field studies - Service life estimation.

TOTAL: 45 PERIODS

OUTCOMES:

On Successful completion of this course, the students will be able to:

- Analyze significance and fundamentals of corrosion, metallic and non-metallic coated rebars

- Determine deterioration in cementitious systems and condition assessment of concrete structure

- Elaborate assessment and protective treatment on concrete structures

- Determine strengthening techniques on structural elements, joints and connections

- Acquire knowledge on service estimation of concrete structures by various field studies and case studies

TEXT BOOKS:

1. Varghese P C, "Maintenance Repair and Rehabilitation & Minor Works of Buildings", PHI Learning Pvt. Ltd., New Delhi, 2014.

2. Michael Raupach and Till Buttner, "Concrete Repair to EN1504 – Diagnosis, Design, Principles and Practice", CRC Press, 1st Edition , 2014.

REFERENCES:

1. Dodge Woodson R, "Concrete Structures – Protection, Repair and Rehabilitation", Butterworth Heinemann, 1st Edition, 2009.

CHAIRMAN
BoS (CIVIL)

IS CODES:

- IRC SP83:2018 Guidelines for Maintenance, Repair and Rehabilitation of Cement concrete pavements

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

24CE507PE	ASEISMIC DESIGN OF STRUCTURES	L	T	P	C
		3	0	0	3

OBJECTIVES:

The student should be made to:

- Gain knowledge in the dynamic behavior of structures under earthquake loading.
- Understand single and multi-degree-of-freedom systems subjected to dynamic forces.
- Learn fundamentals of engineering seismology and seismic hazard assessment.
- Acquire knowledge with the effects of earthquakes on various structural systems.
- Attain skills on earthquake-resistant design principles to structural systems using relevant Indian Standards.

UNIT I   SINGLE DEGREE OF FREEDOM SYSTEM   9

Definition of degree of freedom – Idealization of structure as SDOF system-Formulation of equation of motion for various SDOF systems- D' Alembert's principle – Effect of damping – Active and Passive Dampers- isolators- Free and forced vibration of damped and undamped structures-Response to harmonic and periodic forces – Numerical methods for solving SDOF systems- Introduction to Handbook.

UNIT II   MULTIPLE DEGREE OF FREEDOM SYSTEM   9

Formulation of equations of motion for MDOF systems-Evaluation of natural frequencies and modes - Eigen values and Eigenvectors- Orthogonality of modes – Modal superposition method-Response of damped and undamped MDOF systems.

UNIT III   ENGINEERING SEISMOLOGY AND GROUND MOTION

CHARACTERISTICS   9

Elements of Engineering Seismology – Definitions, introduction to seismic hazard, earthquake phenomenon – Seismotectonics – Seismic zoning –Seismic instrumentation – Characteristics of strong earthquake motion –Estimation of earthquake parameters.

UNIT IV   EARTHQUAKE EFFECTS ON STRUCTURES   9

Effect of earthquake on different types of structures –Behaviour of RCC, steel, prestressed concrete structures under earthquake loading – Pinching effect – Bouchinger effects – Torsion in structures – Evaluation of earthquake forces – IS Code 1893: 2002 –Response spectra – Lessons learnt from past earthquakes.

CHAIRMAN
BoS (CIVIL)

UNIT V   EARTHQUAKE RESISTANT DESIGN CONCEPTS

Causes of damage – Planning considerations /Architectural concept (IS 4326–1993) – Guidelines for Earthquake resistant design – Earthquake resistant design of masonry buildings – Design consideration – Guidelines – Earthquake resistant design of R.C.C. buildings – Tall Buildings- High rise buildings- Lateral load analysis – Design and detailing (IS 13920:1993).

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to:

- Interpret dynamic response of structures subjected to earthquake forces.
- Illustrate systems with single and multiple degrees of freedom that are influenced by dynamic forces.
- Develop damped and undamped MDOF systems.
- Analyze the impact of earthquakes on different structural systems by utilizing real-world observations and relevant code.
- Examine earthquake-resistant design principles in structural systems in accordance with applicable Indian Standards.
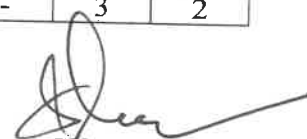
TEXT BOOKS:

1. Damodarasamy S R and Kavitha S, "Basics of Structural Dynamics and Aseismic Design", PHI Learning Pvt. Ltd., 5th Edition, 2009.
2. Mario Paz and Young Hoon Kim, "Structural Dynamics – Theory and Computations", 6th Edition, Springer Nature Switzerland AG Publishers, 6th Edition, 2019.

REFERENCES:

1. Anil K. Chopra , "Dynamics of Structures", Pearson Global Editions, 5th Edition, 2020
2. Clough R.W, and Penzien J, "Dynamics of Structures", 2nd Edition, CBS publishers, 2015
3. Madhujit Mukhopadhyay, "Structural Dynamics: Vibrations & Systems", Ane Books Pvt. Ltd, 2nd Edition, 2021.

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

24CE601PE	EARTH AND ROCKFILL DAMS	L	T	P	C
		3	0	0	3

OBJECTIVES:

The students should be made to:

- Recall the fundamental concepts and design considerations involved in dam construction.
- Relate principles of slope stability and seepage in earthen and embankment dams.
- Understand mechanisms and failure criteria of hydraulic fracturing in soil and rock foundations.
- Learn stability analysis and causes failures of earthen dams.
- Outline general characteristics, failures of rockfill dams.

UNIT I   DESIGN CONSIDERATION   9

Design consideration - Factors influencing design - Types of earth and rock fill dams - Design details - Provisions to control pore pressure.

UNIT II   SLOPE STABILITY AND SEEPAGE ANALYSIS   9

Stability analysis-methods, critical slip surfaces, strength parameters, Method of Slices - Bishop's method- Flow nets- Stability conditions during construction- Full reservoir and drawdown - cut off walls - Trenches - Importance of drainage and filters.

UNIT III   HYDRAULIC FRACTURING   9

Introduction - Conditions and mechanisms for hydraulic fracturing- Failure criterion for hydraulic fracturing – cubic specimen with a crack – core with a transverse crack - core with a vertical crack - strike–dip of easiest crack spreading - factors affecting hydraulic fracturing - self-healing ofa core crack.

UNIT IV   FAILURE AND DAMAGES OF EARTH DAMS   9

Stability analysis - methods - critical slip surfaces - strength parameters - Piping - Differential settlement - Foundation slides - Earthquake damage - creep and anisotropic effects - Reservoir wave action - Dispersive piping.

CHAIRMAN
BoS (CIVIL)

UNIT V ROCK FILL DAMS

General characteristics- rock fill materials- foundation- construction- deformations-types of dams-design of dam section- concrete face and earth core- nature of failures and damages- case studies.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to:

- Summarize design factors to be considered in dams.
- Interpret slope stability principles under various seepage conditions to design safe earth and rock fill dams.
- Illustrate dam stability against hydraulic fracturing and its remedial measures.
- Apply mechanisms of failures in earth dams and its preventive measures to avoid field distress.
- Examine nature of failures and damages in rock fill dams.

TEXTBOOKS:

1. Kramer, S.L. Geotechnical Earthquake Engineering, Pearson, Reprint 2014.
2. Idriss, I.M., & Boulanger, R.W. Soil Liquefaction During Earthquakes, EERI, 2nd Edition., 2019.

REFERENCES:

1. Villaverde, R. Fundamental Concepts of Earthquake Engineering, 2nd Ed., CRC Press, 2021.
2. Towhata, I. Geotechnical Earthquake Engineering, Springer, 2018.

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

24CE602PE   **GEO-ENVIRONMENTAL ENGINEERING**   L   T   P   C

                                                         3   0   0   3

OBJECTIVES:

The students should be made to:

- Recall the sources and causes of ground contamination and its impact.
- Learn stability and safe disposal practices of waste.
- Understand concepts of contaminant transport and transformation in subsurface and groundwater systems.
- Outline waste stabilization and solidification methods, towards sustainable approach
- Infer appropriate remediation techniques for contaminated soils.

UNIT I   FUNDAMENTALS OF GEO-ENVIRONMENTAL ENGINEERING   9

Scope of Geo-Environmental Engineering - multiphase behaviour of soil - role of soil in Geo-Environmental applications - importance of soil physics, soil chemistry, hydrogeology, biological process - sources and type of ground contamination - impact of ground contamination on geo-environment - case histories on geoenvironmental problems.

UNIT II   SITE SELECTION AND SAFE DISPOSAL OF WASTE   9

Safe disposal of waste - Site selection for landfills - Characterization of land fill sites and waste - Risk assessment - Stability of landfills - Current practice of waste disposal - Biomedical Waste- Monitoring facilities - Passive containment system - Application of geosynthetics in sustainable solid waste management - Rigid or flexible liners.

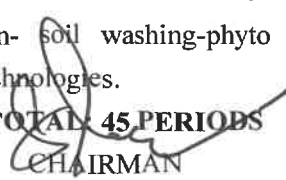**UNIT III   TRANSPORT OF CONTAMINANTS   9**

Contaminant transport in sub surface - Advection, Diffusion, Dispersion - Governing equations - Contaminant transformation - Sorption - Biodegradation - Ion exchange - Precipitation - Hydrological consideration in land fill design - Ground water pollution.

UNIT IV   WASTE STABILIZATION   9

Stabilization - Solidification of wastes - Micro and macro encapsulation - Absorption, Adsorption, Precipitation - Detoxification - Sustainable Mechanism of stabilization - Organic and inorganic stabilization – Utilization of solid waste for soil improvement – Case studies.

UNIT V   REMEDIATION OF CONTAMINATED SOILS   9

Exsitu and Insitu remediation-Solidification- bio-remediation- incineration- soil washing-phyto remediation- soil heating-vetrification-bio-venting- Advancements in recent technologies.

                                                 TOTAL 45 PERIODS

                                                 CHAIRMAN
                                                 BoS (CIVIL)

OUTCOMES:

On successful completion of this course, the students will be able to:

- Explain significance of geo-environmental engineering and the impact of soil contamination.
- Illustrate current practices in safe waste disposal and landfill design.
- Apply efficient transport principles and contaminant transformation
- Analyze stabilization and solidification methods for different types of waste.
- Categorize remediation measures for contaminated soil conditions.

TEXT BOOKS:

1. Sharma H.D. and Reddy K.R., Geoenvironmental Engineering: Site Remediation, Waste Containment, and Emerging Waste Management Technologies, 3rd Ed., John Wiley & Sons, Inc., 2004.

2. Rowe R.K., Geotechnical and Geoenvironmental Engineering Handbook, 5th Ed., Kluwer Academic Publications, 2000.

REFERENCES:

1. Reddi L.N. and Inyang, H. I., Geoenvironmental Engineering, Principles and Applications, 1st Edition, CRC Press, 2000.

2. Yong, R. N., "Geoenvironmental Engineering, Contaminated Soils, Pollutant Fate, and Mitigation" CRC Press, New York, 2001.

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

MARINE GEOTECHNICAL ENGINEERING **L T P C**

3 0 0 3

OBJECTIVES:

The Students should be made to

- Understand the characteristics of marine soil deposits and offshore geotechnical conditions.
- Gain skills on modern site investigation and sampling techniques for marine soil deposits.
- Analyze the behavior of marine soils subjected to repeated or cyclic loading.
- Learn design concepts of foundation suitable for marine soil.
- Outline numerical modeling techniques to enhance the performance of marine foundations under cyclic loads.

UNIT I   MARINE SOIL DEPOSITS   9

Offshore environment- Offshore structures - foundations- Specific problems related to marine soil deposits- Physical and engineering properties of marine soils.

UNIT II   SITE INVESTIGATION IN THE CASE OF MARINE SOIL DEPOSITS 9

Challenges of site investigation in marine environment - Different site investigation techniques - sampling techniques - Geophysical methods - Recent advancements in site investigation - sampling used for marine soil deposits.

UNIT III   BEHAVIOR OF SOILS SUBJECTED TO REPEATED LOADING   9

Effect of wave loading on foundations of marine structures - Behavior of marine deposits under cyclic loading - Cyclic behavior of soils - Fundamental theory of mechanics - Approximate engineering methods.

UNIT IV   FOUNDATIONS IN MARINE SOIL DEPOSITS   9

Different offshore and nearshore foundations - Gravity platforms - Jack-up rigs - pile foundations – cassions - spudcans.

CHAIRMAN
BoS(CIVIL)

Numerical modeling of cyclic behaviour of soils- empirical models- elastic-plastic models- FEM analysis of marine foundations subjected to wave loading.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain the physical and engineering properties of marine soil deposits and their challenges.

- Summarize marine site investigation techniques and assess recent advancements in geophysical and sampling methods.

- Interpret cyclic behavior of marine soils subjected to wave loading using theoretical and approximate methods.

- Categorize types of marine foundations and justify their suitability for specific offshore conditions.

- Analyze numerical models to simulate marine foundation behavior.
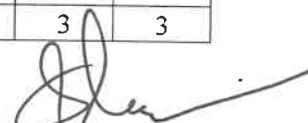
TEXT BOOKS:

1. Ben C Gerwick,jr., "Construction of marine and offshore structures", CRC Press, Taylor and Francis Group, 3rd Edition, 2007

2. George P T sinker, "Port Engineering planning, construction, maintenance and security", John Wiley & Sons, Inc.2004.

REFERENCES:

1. Poulos, H.G. Marine Geotechnics, Routledge, 2019.

2. Yong Bai & Qiang Bai. Subsea Engineering Handbook, 2nd Ed., Gulf Professional Publishing, 2019.

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS(CIVIL)

24CE604PE   **GROUND IMPROVEMENT TECHNIQUES**   L   T   P   C

                                                          3   0   0   3

OBJECTIVES:

The student should be made to:

- Recall appropriate ground improvement techniques for various problematic soil conditions.
- Acquire knowledge on different dewatering techniques and seepage control methods.
- Understand in situ treatment methods for cohesionless and cohesive soils.
- Outline concepts of earth reinforcement and applications of geosynthetics.
- Infer grouting techniques for soil stabilization.

UNIT I   PROBLEMATIC SOIL AND IMPROVEMENT TECHNIQUES   9

Role of ground improvement in foundation engineering – Methods of ground improvement – Geotechnical problems in alluvial - lateritic and black cotton soils – Selection of suitable ground improvement techniques based on soil conditions.

UNIT II   DEWATERING   9

Dewatering Techniques – Well points – Vacuum and electro osmotic methods – Seepage analysis for two – Dimensional flow - fully and partially penetrated slots - homogeneous deposits – Simple cases – Design.

UNIT III IN SITU TREATMENT OF COHESIONLESS AND COHESIVE SOILS

9

Soil nailing and ground anchors - rock anchoring, micro-piles - design methods - construction techniques - Functions and applications of geosynthetics – geotextiles – geogrids – geomembranes - soil reinforcement using strips - bars and geosynthetics - In situ densification of cohesionless soils - consolidation of cohesive soils - Dynamic compaction vibro flotation - sand compaction piles - deep compaction – Consolidation - preloading with sand drains and fabric drains - stone columns and lime piles.

UNIT IV   EARTH REINFORCEMENT   9

Concept of reinforcement – Types of reinforcement material – Reinforced earth wall – Mechanism – Simple design – Applications of reinforced earth – Role of geo textiles in filtration – drainage – separation- road works and containment.

CHAIRMAN
BoS (CIVIL)

UNIT V GROUTING TECHNIQUES

Types of grouts – Grouting equipments and machinery – Injection methods – Grout monitoring - Permeation grouting - compaction grouting - jet grouting - different varieties of grout materials - grouting under difficult conditions – Stabilization with cement - lime and chemicals – Stabilization of expansive soil –Sheet Piling Techniques - Advancements in recent technologies.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to:

- Understand the various problems associated with different types of soils and suggest suitable ground improvement techniques.
- Demonstrate understanding of dewatering techniques and conduct basic seepage analysis.
- Apply appropriate in situ treatments for cohesionless and cohesive soils.
- Analyze and differentiate types of earth reinforcement and geosynthetics and their field applications.
- Design and implement suitable grouting techniques for various geotechnical conditions.
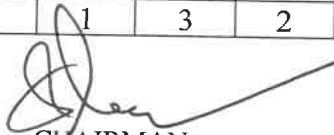
TEXT BOOKS:

1. Klaus Krisch and Alan Bell, "Ground Improvement", CRC Press, London, 3rd Edition 2013.
2. Moseley M. P., Ground Improvement, Blockie Academic and Professional, Chapman and Hall, Glassgow, 1993.

REFERENCES:

1. Purushotham Raj, Ground Improvement Techniques, Laxmi Publications, New Delhi, 1996.
2. Hausmann, M. R., Engineering Principles of Ground Modification, McGraw – Hill International Editions, 1990.

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

24CE605PE	EARTHQUAKE GEOTECHNICAL ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

The students should be made to:

- Recall fundamental concepts of plate tectonics and seismology.
- Understand dynamic properties of soils through field and laboratory testing techniques.
- Infer seismic hazard indicators to identify and evaluate earthquake.
- Learn liquefaction mechanisms and hazards based on geological and compositional factors.
- Outline potential for liquefaction initiation using cyclic stress approaches.

UNIT I   SEISMOLOGY   9

Internal Structure of the Earth - Continental Drift and Plate Tectonics - Faults - Elastic rebound theory - Different sources of Seismic Activity - Geometric Notation - Location of Earthquakes - Size of Earthquakes.

UNIT II   DYNAMIC PROPERTIES OF SOILS   9

Measurement of Dynamic Properties of soils - Field Tests - Low strain - Seismic Reflection - Seismic Refraction - Horizontal layering - Steady-State Vibration - Spectral analysis of surface wave - Seismic cross hole - Down Hole - Uphole tests - Laboratory tests - Resonance Column Test - Bender Element.

UNIT III   SEISMIC HAZARD ANALYSIS   9

Identification and Evaluation of Earthquake Sources - Geologic Evidence - Tectonic Evidence - Historical Seismicity - Instrumental Seismicity - Deterministic Seismic Hazard Analysis.

UNIT IV   LIQUEFACTION   9

Liquefaction - Flow liquefaction - Cyclic Mobility - Evaluation of liquefaction Hazards - Liquefaction Susceptibility Criteria – Historical - Geological and Compositional State.

UNIT V   EVALUATION OF LIQUEFACTION POTENTIALMENT   9

Evaluation of Initiation of Liquefaction - Cyclic stress approach - Characterization of Liquefaction Resistance - SPT Test - Various correction factor - Factor of Safety.

TOTAL: 45 PERIODS

CHAIRMAN
BoS (CIVIL)

OUTCOMES:

On Successful completion of this course, the students will be able to:

- Explain continental drift and earthquake mechanisms of Earth's internal dynamics and their structural impacts.
- Illustrate dynamic properties of soils and assess their behavior under seismic loads.
- Demonstrate seismic hazard scenarios using deterministic seismic hazard analysis.
- Categorize liquefaction hazards and susceptibility criteria of soil stability and risk under seismic conditions.
- Analyze liquefaction potential by analytical and empirical methods.

TEXT BOOKS:

1. Ikuo Towhata, "Geotechnical Earthquake Engineering", Springer-Verlag Heidelberg, 2008.
2. Robert W. Day, "Geotechnical Earthquake Engineering Handbook", McGraw Hill, New York, 2001.

REFERENCES:

1. Villaverde, R. Fundamental Concepts of Earthquake Engineering, 2nd Edition., CRC Press, 2021.
2. Steven L. Kramer, "Geotechnical Earthquake Engineering", Prentice Hall Inc.1996.

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

24CE606PE   **GEOTEXTILE ENGINEERING**   **L   T   P   C**

                                                      3   0   0   3

OBJECTIVES:

The students should be made to:

- Characteristics applications of various geosynthetics.
- Learn properties and manufacturing processes of different geotextile.
- Outline Characteristics and design properties of geogrids.
- Gain skills in design and manufacture of geomembrane.
- Design geosynthetic-based solutions for complex soil-related engineering problems in infrastructure.

UNIT I   INTRODUCTION   9

An overview on the development - functions and applications of various sustainable geosynthetics - the geotextiles - geogrids - geonets - geomembranes - geo composites and other products.

UNIT II   DESIGNING WITH GEOTEXTILES   9

Manufacture of geotextiles -Geotextile properties and test methods - functions - Designing geotextiles for separation - reinforcement - stabilization- filtration and drainage applications.

UNIT III   DESIGNING WITH GEOGRIDS   9

Manufacture of geogrids - Types of geogrids - Geogrid properties and test methods - physical properties - mechanical properties - endurance properties and environmental properties - Designing geogrid for reinforcement in pavements - retaining walls and bearing capacity - Manufacture of geonets - Geonet properties and test methods – Physical properties - mechanical properties - hydraulic properties - endurance properties and environmental properties -Designing geonet for drainage purposes.

UNIT IV   DESIGNING WITH GEOMEMBRANES   9

Manufacture of geomembranes -Sustainable Geomembrane properties - test methods - physical properties - mechanical properties - chemical properties and biological hazard - Applications of geomembranes - relevant designs.

CHAIRMAN
BoS (CIVIL)

UNIT V   DESIGNING WITH GEOCOMPOSITES

Geo composites in separation - reinforcement applications - reinforced geotextile composites - reinforced geomembrane composites - reinforced soil composites - discontinuous fibres and meshes, continuous fibres and three -dimensional cells -Designing for bearing capacity - drainage and filtration purposes- Advancements in recent technologies.

TOTAL: 45 PERIODS

OUTCOMES:

On Successful completion of this course, the students will be able to:
- Explain the development, classification, and functions of various geosynthetics.
- Apply the test methods and properties of geotextiles and geogrids in design applications like separation, reinforcement, and stabilization.
- Make use of geogrids and geonets in pavement and drainage systems.
- Construct geomembranes to control leakage and exposure to chemical or biological hazards.
- Utilize reinforced geotextile composite for various applications.

TEXT BOOKS:

1. Koerner, R.M. Designing with Geosynthetics, 6th Edition., Xlibris, 2012.
2. Sarsby RW, "Geosynthetics in Civil Engineering:", Woodhead Publishing, 1st Edition, 2006.

REFERENCES:

1. G. Venkatappa Rao, Goutam Kumar Pothal, Anil Dixit, Geosynthetics Testing and Evaluation - a Laboratory Manual, International Geosynthetics Society, 2019.
2. Sarsby, R.W. Geosynthetics in Civil Engineering, Woodhead Publishing, 2021.

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

24CE607PE   **TUNNELING ENGINEERING**   **L T P C**

                                                              3 0 0 3

OBJECTIVES:

The student should be made to:

- Understand the application, and historical evolution of tunneling and underground excavations.

- Gain knowledge of different excavation methods used in various ground conditions.

- Infer geometric and alignment requirements of tunnels through geological and topographical surveys.

- Familiarize with advanced tunnelling Construction techniques.

- Outline tunnel supporting systems and ventilation strategies for safe and sustainable construction.

UNIT I   INTRODUCTION   9

Scope and application - historical developments - art of tunneling - tunnel engineering - future tunneling considerations- Types of Underground Excavations - Tunnel - adit -decline - shaft parameters influencing location - shape and size - geological aspects - planning and site investigations.

UNIT II   TUNNELING METHODS   9
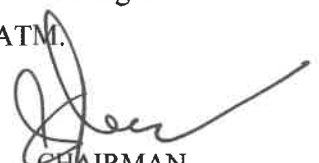
Types and purpose of tunnels - Choice of Excavation Methods - Soft ground tunneling - Hardrock tunneling - Tunnel drilling - Blasting - Impact hammers - Problems encountered - Remedial measures.

UNIT III   PLANNING AND GEOMETRIC DESIGN OF TUNNELS   9

Topographical - Geological survey - Rock sampling - Testing - Determination of location size shape and alignment - Subsidence problem on soft ground - Tunneling design in hard rock.

UNIT IV   CONSTRUCTION OF TUNNEL   9

Advanced drilling techniques - TBM - Cuttability assessment - Shield tunneling -Advantages - Types of shield tunneling -Factors affecting selection of shield - Twin tunnel -NATM.

CHAIRMAN
BoS(CIVIL)

UNIT V   DESIGN OF TUNNEL SUPPORTING SYSTEMS AND VENTILATION 9

Classification of supports - Active - Passive - Permanent - Temporary - Excavation support - Steel supports lining - Grouting - Ground freezing - Environment in underground - Various methods of ventilation.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to:

- Demonstrate factors considered for tunneling and earthwork.

- Develop choice of excavation techniques in soft and hard ground conditions excavation with its associated challenges.

- Experiment with survey and testing data to determine planning and geometric design of tunnels.

- Analyze different tunnel construction techniques to ensure stability.

- Examine tunnel supporting systems and ventilation methods considering environmental and safety requirements.

TEXT BOOKS:

1. Ratan Raj Tatiya, "Surface and underground Excavation", Second Edition,2013.

2. David Chapman, Nicole Metje and Alfred Stark, "Introduction to Tunnel Construction", Spon Press, Second edition,2017.

REFERENCES:

1. Hoek and Brown, "Underground excavation in rock", Revised First Edition,2003.

2. Palmstrom, A., & Stille, H. Rock Engineering, Second Edition, CRC Press, 2014.

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS(CIVIL)

24CE701PE   **GREEN CONSTRUCTION**   **L T P C**

                                                       3 0 0 3

OBJECTIVES:

The student should be made to:

- Understand the fundamentals of sustainable development and its importance in construction
- Learn about green construction materials and innovative technologies that reduce environmental impact.
- Gain knowledge on water, energy, and waste management strategies in green buildings.
- Familiarize with green building rating systems and national/international standards.
- Explain real-world green construction projects and emerging trends.

UNIT I   INTRODUCTION TO GREEN CONSTRUCTION   9

Principles of sustainable development and construction-Definition and scope of green buildings- Importance of green construction in civil engineering- Global and national perspectives - SDGs and construction- Life Cycle Assessment (LCA) of buildings- Challenges and barriers in implementing green practices

UNIT II   GREEN BUILDING MATERIALS AND TECHNOLOGIES
PREFABRICATED ELEMENTS   9

Eco-friendly construction materials: fly ash bricks, AAC blocks, bamboo, recycled aggregates, Geopolymer concrete- Low VOC paints, phase-change materials- Use of industrial and agricultural waste in construction- High-performance insulation, cool roofs and green roofing systems

UNIT III   ENERGY, WATER, AND WASTE MANAGEMENT   9

Energy efficiency in buildings - passive design, day lighting, ventilation- Solar architecture, solar panels, smart HVAC systems- Rainwater harvesting, low-flow fixtures, greywater reuse- Construction and demolition waste management- Sustainable drainage systems (SuDS)

CHAIRMAN
BoS (CIVIL)

UNIT IV   GREEN BUILDING CODES AND RATING SYSTEMS   9

Overview of green building standards and certifications: IGBC (Indian Green Building Council)- GRIHA (Green Rating for Integrated Habitat Assessment)- LEED (Leadership in Energy and Environmental Design)- National Building Code (NBC) - sustainability clauses- Environmental impact assessments (EIA)- Green construction auditing and documentation

UNIT V   CASE STUDIES & GREEN PROJECT MANAGEMENT   9

Case studies of certified green buildings in India and abroad- Economics of green buildings - cost-benefit analysis- Green construction project planning and management- Construction site best practices for sustainability- Digital tools for green construction - BIM, energy modeling tools- Advancements in recent technologies.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to:

- Explain the principles of sustainability and how they apply in construction.
- Relate eco-friendly building materials and construction techniques.
- Make use of energy-efficient, water-saving, and waste-reducing strategies for buildings.
- Apply green building rating systems like IGBC, GRIHA, and LEED.
- Analyze case studies of green buildings using technical and project management perspectives.
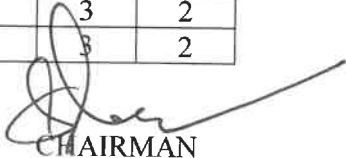
TEXT BOOKS:

1. Charles J.Kibert, "Sustainable Construction: Green Building Design and Delivery", Wiley/ John Wiley & Sons Inc, 5th Edition, 2022
2. Edward Allen & Joseph Iano, "Fundamentals of Building Construction: Materials and Methods, Wiley", 7th Edition, 2019

REFERENCES:

1. K.S. Jagadish, B.V. Venkatarama Reddy, K.S Nanjunda Rao, "Alternative Building Materials and Technologies", New Age International, 3rd Edition, 2024.
2. BIS IS 1893, IS 875, NBC – Sustainable Development Provisions, 2023.
3. Ross Spiegel & Dru Meadows, "Green Building Materials: A Guide to Product Selection and Specification" 4th Edition, Wiley, 2019

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

24CE702PE	RETROFITTING AND REHABILITATION OF CIVIL INFRASTRUCTURE	L	T	P	C
		3	0	0	3

OBJECTIVES:

The student should be made to:

- Understand the overview of the retrofitting techniques.

- Illustrate on fibre reinforced polymer composites retrofitting.

- Evaluate the performance on concrete overlay.

- Impart knowledge on the retrofitting of building structures.

- Attain skills on the retrofitting of steel structures.

UNIT I   OVERVIEW OF RETROFITTNG   9

Overview of Retrofitting and Rehabilitation of Civil Infrastructure - Condition Evaluation andTesting - General Repair and Strengthening of Concrete Structures

UNIT II   FIBER REINFORCED POLYMER COMPOSITES   9

Fiber Reinforced Polymer Composites (FRPC) and its Characteristics - Retrofitting by FRPComposites.

UNIT III   CONCRETE OVERLAY   9

Concrete Overlay for Pavement Rehabilitation - Retrofitting of Masonry Structures

UNIT IV   RETROFITTING OF BUILDING STRUCTURES   9

Retrofitting of Building structures damaged due to seismic event- Retrofitting of Special structures damaged due to seismic events

UNIT V   RETROFITTING OF STEEL STRUCTURES   9

Retrofitting of Steel Structures - Seismic Retrofit of Steel Structures – Steel Structures retrofitting techniques

TOTAL:45 PERIODS

CHAIRMAN
BoS(CIVIL)

OUTCOMES:

On successful completion of this course, the students will be able to:

- Gain knowledge on various concepts of repair, retrofitting and strengthening of concretestructures.

- Interpret the ideas of fibre reinforced polymer composites retrofitting.

- Identify the key elements on performance of concrete overlay.

- Execute the retrofitting of building structures.

- Evaluate the concepts of retrofitting of steel structures.

TEXT BOOKS:

1. A.M.Neville, J.J.Brooks, "Concrete Technology", Pearson Education Limited, England, 2010.

2. Thomas Dyer, "Concrete Durability", CRC Press, London, 2014.

REFERENCES:

1. V.M.Malhotra, "Handbook on Non destructive Testing of Concrete", CRC Press, London2004

2. L. C. Bank, "Composites for Construction", John Wiley & Sons, Inc, 2006.

3. ACI 440.2R-08, "Guide for the Design and Construction of Externally Bonded FRP Systems for Strengthening Concrete Structures", American Concrete Institute,2008.

4. IS15988:2013, "Seismic Evaluation and Strengthening of Existing Reinforced Concrete Buildings".

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS(CIVIL)

24CE703PE　　**MODERN CONSTRUCTION MATERIALS**　　**L　T　P　C**

　　　　　　　　　　　　　　　　　　　　　　　　　　　　　3　0　0　3

OBJECTIVES:

The students should be made to:

- Learn engineering and technology of materials.

- Understand atomic bonding, structure of solids and movement of atoms in solids.

- Gain knowledge on fracture mechanics

- Analyze concepts of wood and wood products and fiber reinforced polymer.

- Execute water proofing, floor finish techniques

UNIT I　BASICS AND CLOSURE　　　　　　　　　　　　　　　　　9

Prologue - Introduction to the course - Science, engineering and technology of materials - Environmental concerns -Social perception of construction materials – Closure

UNIT II　MICROSTRUCTURE　　　　　　　　　　　　　　　　　9

Atomic bonding - Structure of solids - Movement of atoms - Development of microstructure.

UNIT III　MATERIAL BEHAVIOUR　　　　　　　　　　　　　　　9

Surface properties - Response to stress - Failure theories - Fracture mechanics - Rheology - Thermal properties.

UNIT IV　STRUCTURAL MATERIALS　　　　　　　　　　　　　9

Review of construction materials and criteria for selection - Wood and wood products - Polymers- Fiber reinforced polymers - Metals - Bituminous materials - Concrete – Glass

UNIT V　NON-STRUCTURAL MATERIALS, ACCESSORIES AND FINISHES　　9

Review of non-structural materials and criteria for selection - Waterproofing materials - Polymer Floor finishes - Paints - Tiles - Acoustic treatment - Dry walls - Anchors

TOTAL: 45 PERIODS

CHAIRMAN
BoS (CIVIL)

OUTCOMES:

On Successful completion of this course, the students will be able to:

- Analyze different modern materials used in construction.

- Develop skills to learn development of microstructure and movement of atoms in solids

- Elaborate fracture theories and mechanics

- Acquire knowledge about wood products, bituminous material and fiber reinforced polymer.

- Execute water proof techniques, floor finishes and anchors.

TEXT BOOKS:

1. Varghese P C, "Building Materials", Prentice Hall India Learning Private Limited, 2nd Edition, 2015.

2. Neville A M, " Properties of Concrete", Pearson Education India, 5th Edition, 2012.

REFERENCES:

1. Raghavan V, "Materials Science and Engineering", Prentice Hall India Learning Private Limited, 6th Edition, 2015.

2. Higgins R A, " The Properties of Engineering Materials", Industrial Press Inc ,U.S, 2nd Edition, 1994.

3. Illston J M, Demone P L J, "Construction Material, Their Nature and Behaviour", CRC Press, 2001

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

| 24CE704PE | ADVANCED CONSTRUCTION | L | T | P | C |
| | TECHNIQUES | 3 | 0 | 0 | 3 |

OBJECTIVES:

The students should be made to:

- Understand substructure construction techniques in projects.

- Gain insight into advanced superstructure and high-rise construction methods.

- Learn modern construction methodologies of special structures.

- Outline structural rehabilitation, retrofitting and strengthening techniques.

- Infer demolition techniques with safety and technological advancements.

UNIT I SUB STRUCTURE CONSTRUCTION   9

Box and pipe jacking - Diaphragm walls and basement construction - Basic tunneling techniques - Piling and well foundation - Dewatering methods - Shoring for deep cuts - Cable anchoring - Sheet piles overview - Intro to offshore systems.

UNIT II SUPER STRUCTURE CONSTRUCTION FOR BUILDINGS   9

Vacuum dewatering - Concrete paving techniques - Tall building concreting - In-situ prestressing basics - Metal deck systems - Light component handling in tall buildings.

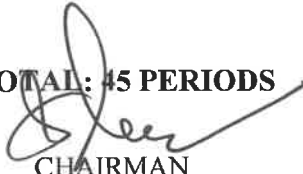## UNIT III CONSTRUCTION OF SPECIAL STRUCTURES   9

Cooling towers - Silos – Chimneys - Cable-stayed bridge basics - Construction of jetties - Precast component erection basics.

UNIT IV REHABILITATION AND STRENGTHENING TECHNIQUES   9

Seismic retrofitting - Strengthening of beams and slabs - Underpinning - Subgrade waterproofing - Soil stabilization - Mud jacking methods.

UNIT V DEMOLITION TECHNIQUES   9

Demolition Techniques, Demolition by Machines - Demolition by Explosives - Advanced techniques using Robotic Machines - Safety precaution in Demolition and Dismantling- Advancements in recent technologies.

TOTAL: 45 PERIODS

CHAIRMAN
BoS (CIVIL)

OUTCOMES:

On Successful completion of this course, the students will be able to:

- Explain substructure techniques and their applications in complex construction projects.

- Demonstrate advanced techniques adopted in high-rise and large span structure construction.

- Illustrate construction sequence for special structures including precast component erection.

- Utilize modern techniques in retrofitting and strengthening of existing structures.

- Examine safe and advanced demolition techniques with safety precautions.

TEXT BOOKS:

1. Peter H. Emmons, Concrete Repair and Maintenance Illustrated, Wiley, 2nd Edition., 2019.

2. S.K. Sankar & S. Saraswati, Construction Technology, Oxford University Press, 3rd Edition., 2019.

REFERENCES:

1. Jerry Irvine, Advanced Construction Techniques, CA Rocketr, Updated Reprint, 2016.

2. Patrick Powers J., Construction Dewatering: New Methods and Applications, Wiley, 3rd Edition., 2007.

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

24CE705PE	CONSTRUCTION PLANNING AND	L	T	P	C
	SCHEDULING	3	0	0	3

OBJECTIVES:

The students should be made to:

- Understand the fundamental concepts of planning and scheduling in construction projects.

- Infer modern scheduling tools, resource optimization, and project forecasting methods.

- Gain skills on cost control, accounting integration and risk-based schedule simulation.

- Develop the ability to implement quality and safety management throughout construction phases.

- Utilize project databases and information systems for efficient project lifecycle management.

UNIT I   CONSTRUCTION PLANNING   9

Fundamentals of Construction Planning - Identification and Breakdown of Work Tasks - Defining Precedence Relationships - Choice of Technology and Method Selection -Estimating Activity Durations and Resource Requirements - Introduction to Lean Construction Planning and Last Planner System

UNIT II   SCHEDULING PROCEDURES AND TECHNIQUES   9

Construction Scheduling Techniques - Critical Path Method (CPM) - Float and Slack Calculation - Bar Charts, Gantt Charts - Activity-on-Node (AON) Diagrams - Leads, Lags, and Time Windows - Scheduling under Resource Constraints - Integration with Software Tools (Primavera P6, MS Project)

UNIT III   COST CONTROL, MONITORING AND ACCOUNTING   9

Understanding Project Costs - Project Budgeting and Forecasting - Activity-wise Cost Control - Financial Accounts and Cash Flow Management - Cost Tracking and Performance Review- Earned Value Management (EVM)

UNIT IV   QUALITY CONTROL AND SAFETY DURING CONSTRUCTION   9

Essentials of Quality and Safety in Construction - Work and Material Specifications - Total Quality Management (TQM) - Statistical Quality Control (SQC) using Sampling Methods - Introduction to ISO 9001:2015 and ISO 45001:2018 Standards - Digital Safety Tools

CHAIRMAN
BoS (CIVIL)

Types and Flow of Project Information -Importance of Accuracy in Construction Data - Organizing Data in Construction - Relational and Conceptual Database Models - Introduction to Construction ERP Systems - Centralized vs. Cloud-Based Information Systems - Integration with Building Information Modeling (BIM)

TOTAL: 45 PERIODS

OUTCOMES:

On Successful completion of this course, the students will be able to:

- Extend construction plans by identifying tasks, methods, durations, and resource needs.

- Summarize scheduling techniques and manage constraints using digital tools and simulations.

- Interpret construction costs and cash flows through integrated monitoring and forecasting.

- Apply quality control and safety precautions as per design standards.

- Simplify project information through modern database systems and collaborative platforms.
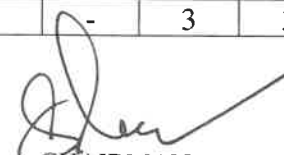
TEXT BOOKS:

1. Chris Hendrickson & Tung Au, Project Management for Construction: Fundamental Concepts, Prentice Hall, Revised Online Edition, 2021.

REFERENCES:

1. Calin M. Popescu & Chotchai Charoenngam, Project Planning, Scheduling, and Control in Construction, Wiley, 2nd Ed., 2016.

2. K.K. Chitkara, Construction Project Management: Planning, Scheduling and Control, McGraw Hill, 4th Ed., 2019.

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

| 24CE706PE | SAFETY IN CIVIL ENGINEERING | L | T | P | C |
| | PRACTICES | 3 | 0 | 0 | 3 |

OBJECTIVES:

The students should be made to:

- Understand the fundamental causes and human factors behind construction accidents.

- Gain knowledge on sustainable green construction safety practices.

- Outline safety in machining and material handling in civil engineering project analysis.

- Infer construction regulations and codes with emphasis on sustainability and worker welfare.

- Summarize safe practices in demolition and emergency responses in buildings.

UNIT I   INTRODUCTION TO CONSTRUCTION SAFETY   9

Overview of the Indian construction industry - Causes of accidents - Key stakeholders and their roles - Introduction to safety culture - Human error and decision-making - Updated ergonomic practices in construction - Integration of technology (like sensors and wearables) in improving safety outcomes.

UNIT II   OPERATIONAL SAFETY IN CONSTRUCTION SITES   9
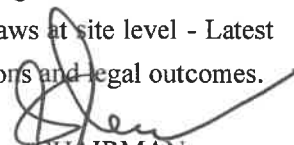
Revised focus on confined space entry protocols and underwater work safety - Updated methods for trench and shoring safety - Revisited blasting and dismantling norms - Indian standards for noise & air quality management at construction sites - Overview of sustainable green construction safety practices.

UNIT III   SAFETY IN MACHINERY AND MATERIAL HANDLING   9

New focus on robotics and automation in material handling - Safety during use of drones and AI-driven equipment - Safety protocols for temporary electrification - Updated fire safety codes - Training modules for construction vehicle operators - Storage hazard risk assessment.

UNIT IV   CONSTRUCTION LAW, CODES AND PRACTICES   9

Updated provisions from Code on Occupational Safety - Health and Working Conditions - 2020 - Digital platforms for contractor registration – Practical application of labour laws at site level - Latest guidelines under National Building Code (NBC) 2016 - Case review of violations and legal outcomes.

CHAIRMAN
BoS (CIVIL)

Safety in robotic demolition - Environmental impact of demolition waste - First-aid readiness and health kits - Hazardous material identification - Fire escape planning - Real-life case studies (fire, collapse, gas leakage) and their root cause analysis- Advancements in recent technologies.

TOTAL: 45 PERIODS

OUTCOMES:

On Successful completion of this course, the students will be able to:

- Demonstrate accident causes and safety practices in construction using updated ergonomic tools.

- Explain operational safety in construction sites.

- Organize machinery safety and site electrification as per IS standards.

- Utilize safety related legal frameworks and codes with real world implications.

- Analyze emergency response plans, environmental and assess safety in demolition.
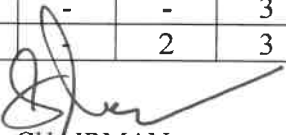
TEXT BOOKS:

1. Raymond E. Levitt & Nancy M. Samelson, Construction Safety Management, Wiley, 2nd Edition., 2019.

2. Davies V.J. & Tomasin K., Construction Safety Handbook, ICE Publishing, 2nd Edition., 2020

REFERENCES:

1. Jnathea D. Sime, Safety in the Built Environment, Routledge, 2017 Reprint.

2. R.T. Ratay, Handbook of Temporary Structures in Construction, McGraw Hill, 3rd Ed., 2012.

3. J.B. Fulman, Construction Safety, Security & Loss Prevention, Wiley, Updated Reprint, 2016.

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

24CE707PE	SMART MATERIALS		L	T	P	C
			3	0	0	3

OBJECTIVES:

The students should be made to:

- Gain knowledge on characteristics of smart and advanced multifunctional materials.

- Understand molecular level polymer mechanisms and applications that drive smart behavior.

- Infer properties, synthesis, and applications of various stimuli responsive materials.

- Outline properties of advanced magnetostrictive materials.

- Extend knowledge in shape memory ceramics and polymers.

UNIT I	INTRODUCTION TO SMART MATERIALS	9

Overview of materials- metals - polymers - and ceramics - Introduction to sustainable smart materials - definition and characteristics - Classification based on stimuli (thermal, electrical, magnetic, mechanical) - Smart systems components - sensors - actuators - control units - Recent innovations and applications in aerospace - civil - biomedical - and energy sectors.

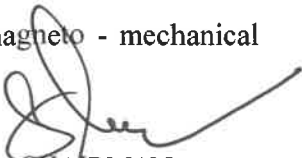| UNIT II	SMART POLYMERS	9

Introduction to responsive polymers - Thermally and pH-sensitive systems - Electroactive and photo responsive polymers - working principles - Advances in microgel systems - Natural and protein-based smart polymers - synthesis and function - Applications in drug delivery - self-healing materials - and soft robotics.

UNIT III	PIEZOELECTRIC MATERIALS	9

Basic concepts of piezoelectricity - Piezoelectric constants and materials - PZT - PVDF - Comparison of polycrystalline vs single-crystal structures - Applications in sensors - actuators - vibration control - Composite piezoelectric materials - Miniaturization and integration in MEMS devices.

UNIT IV	MAGNETOSTRICTIVE MATERIALS	9

Mechanisms - Joule - Villari - Matteucci - Wiedemann effects - Properties of advanced magnetostrictive materials - Terfenol-D - Galfenol – Metglas - Use in actuators - sonar – vibration damping, and magnetic field sensing - Advances in hybrid magneto - mechanical systems.

CHAIRMAN
BoS (CIVIL)

Shape Memory Effect (SME) and martensitic transformation - NiTi alloys - binary and ternary systems - Functional properties - one way and two way SME - Shape memory ceramics and polymers - features and limitations - Future directions in structural health monitoring and biomedical implants.

TOTAL: 45 PERIODS

OUTCOMES:

On Successful completion of this course, the students will be able to:

- Explain various classes and behaviors of smart materials and their role in modern engineering applications.
- Summarize characteristics and synthesis of smart polymers for responsive material design.
- Utilize working principles and applications of piezoelectric materials in engineering systems.
- Make use of functionality of magnetostrictive materials and propose their use in smart structures.
- Examine features of shape memory ceramics in structural health monitoring.

TEXT BOOKS:

1. D.J. Leo, Engineering Analysis of Smart Material Systems, Wiley, 2nd Edition, 2007.
2. M.V. Gandhi & B.D. Thompson, Smart Materials and Structures, Chapman & Hall/CRC, Revised Edition, 1992.

REFERENCES:

1. K. Otsuka & C.M. Wayman, Shape Memory Materials, Cambridge University Press, 2nd Ed., 2016.
2. P. Ball, Made to Measure: Materials for the 21st Century, Princeton University Press, Updated Edition, 2019.
3. M. Addington & D.L. Schodek, Smart Materials and New Technologies in Architecture, Routledge, 2nd Ed., 2018.

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

24CE801PE   URBAN FLOOD MANAGEMENT AND DRAINAGE   L   T   P   C

                                        SYSTEM   3   0   0   3

OBJECTIVES:

The students should be made to:

- Explain minimizes flood risk in urban areas and protects life and property.
- Understand efficient stormwater drainage and prevent waterlogging.
- Construct conserve natural water bodies and drainage channels for ecological balance.
- Develop groundwater recharge and promote sustainable urban development.
- Examine disaster preparedness through early warning systems and community awareness

UNIT I   BASIC ISSUES   9

Definition of Human settlement - Urban area - Town -City -Urbanisation -Suburbanisation - Urban sprawl - Peri - urban areas - Central Business District (CBD) - Classification of urban areas - Trend of Urbanisation at International – National - Regional and State level.

UNIT II   PLANNING PROCESS   9

Principles of Planning - Types and Level of Plan - Stages in Planning Process - Goals - Objectives - Delineation of Planning Areas - Surveys and Questionnaire Design.

UNIT III   DEVELOPMENT PLANS, PLAN FORMULATION AND EVALUATION   9

Scope and Content of Regional Plan - Master Plan - Detailed Development Plan - Development Control Rules - Transfer of Development Rights - Special Economic Zones- Development of small town and smart cities- Case studies
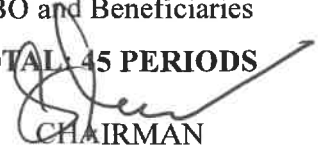
UNIT IV   PLANNING AND DESIGN OF URBAN DEVELOPMENT PROJECTS   9

Site Analysis - Layout Design - Planning Standards - Project Formulation – Evaluation - Plan Implementation - Constraints and Implementation - Financing of Urban Development Projects.

UNIT V   LEGISLATION, DEVELOPMENTAND MANAGEMENT OF URBAN SYSTEM   9

Town and Country Planning Act - Land Acquisition and Resettlement Act - Urban Planning Standards and Regulations - Involvement of Public – Private – NGO - CBO and Beneficiaries

TOTAL 45 PERIODS

CHAIRMAN
BoS (CIVIL)

OUTCOMES:

On Successful completion of this course, the students will be able to:

- Interpret basic issues in urban planning
- Summarizes planning process for urban and rural development and
- Illustrate socio economic aspects of urban and rural planning with its formulation and evaluation.
- Develop planning and design of urban development projects.
- Examine legislation, development and management of urban system.

TEXT BOOKS:

1. S. Mambretti, D. Proverbs "Urban Water Systems & Floods III", WIT Press, 2020.

2. Stefano Mambretti, David Proverbs, Urban Water Systems & Floods IV, WIT Press, 2022.

REFERENCES:

1. Chris Zevenbergen, et.al., "Urban Flood Management", CRC Pres, 1st edition, 2010.

2. Jonathan N. Parkinson, Joel A. Goldenfum, Carlos E. M. Tucci, Integrated Urban Water Management, CRC Pr I Ll, 1st edition, 2010.

3. Jorge Leandro, James Shucksmith, "Modelling of Floods in Urban Areas", MDPI AG, 2022.

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

24CE802PE   **ADMIXTURES AND SPECIAL CONCRETES**   **L   T   P   C**

                                                                    3   0   0   3

OBJECTIVES:

The students should be made to:

- Evaluate various requirements of cement, aggregates and water for making concrete.

- Understand various effects of Chemical admixtures on properties of concrete.

- Recognize the effects of Mineral admixtures on properties of concrete.

- Determine properties of concrete at fresh and hardened state.

- Execute the importance and application of special concretes.

UNIT I   CEMENT COMPOSITION   9

Cement chemistry and concrete performance - An overview

UNIT II   CHEMICAL ADMIXTURES   9

Introduction & Water reducers- Set controllers, Standards on chemical admixtures & Air entraining agents- Understanding concrete rheology, Viscosity modifying agents, Shrinkage reducing admixtures, & Other specialty admixtures

UNIT III   MINERAL ADMIXTURES   9

Introduction, classification and pozzolanic activity- Fly ash and Silica fume- GGBFS, Metakaolin and LC3- Agricultural ashes, characterization techniques Life Cycle Assessment

UNIT IV   FRESH AND HARDENED PROPERTIES OF CONCRETE   9

Workability-Tests for workability of concrete-Slump Test and Compacting factor Test-Segregation and Bleeding-Determination of Compressive and Flexural strength as per BIS - Properties of Hardened concrete- Stress-strain curve for concrete-Determination of Modulus of elasticity.

CHAIRMAN
BoS (CIVIL)

High strength concrete and ultra high performance concrete- Self compacting concrete and mass concreting-Mass concreting and lightweight concrete- High density concrete and concrete for 3D printing.

TOTAL: 45 PERIODS

OUTCOMES:

On Successful completion of this course, the students will be able to:

- Apply knowledge on various requirements of concrete making materials.

- Analyze the effect of chemical admixtures on properties of concrete.

- Interpret the effect of mineral admixtures on properties of concrete.

- Recognize the various fresh and hardened properties of concrete.

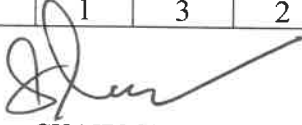- Enumerate properties and applications of special concrete.

TEXT BOOKS:

1. Mehta, P. K., and Monteiro, P. J. M., Concrete: Microstructure, Properties, and Materials, Fourth Edition (Indian Edition), McGraw Hill, 2014.

2. Thomas M.D.A., Supplementary Cementing Materials in Concrete, CRC Press, Francis & Taylor Group, Florida, USA, 2013.

REFERENCES:

1. Neville, A. M., Properties of Concrete, Pitman Publishing, Inc., MA, 1981.
2. Bentur, A., Diamond, S., and Berke, N.S., Steel Corrosion in Concrete, E&FN Spon, UK, 1997.
3. Taylor, H. W. F., Cement Chemistry, Academic Press, Inc., San Diego, CA, 1990.
4. Lea, F. M., The Chemistry of Cement and Concrete, Chemical Publishing Company, Inc., New York, 1971.

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

24CE803PE   SMART MATERIALS AND SMART STRUCTURES   L T P C

3 0 0 3

OBJECTIVES:

The students should be made to:

- Develop knowledge on smart materials and its response on instrumented structures.
- Explain the concepts of measurement using smart materials
- Understand the sensing technology in smart structures.
- Infer the actuator techniques and materials for structural assessment.
- Apply the data acquisition and data processing techniques for a sensor

UNIT I   INTRODUCTION   9

Introduction to Smart Materials and Structures – Instrumented structures functions and response – Sensing systems – Self-diagnosis – Signal processing consideration –Actuation systems and effectors.

UNIT II   MEASURING TECHNIQUES   9

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

UNIT III   SENSORS   9

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

UNIT IV   ACTUATORS   9

Actuator Techniques – Actuator and actuator materials – Piezoelectric and Electrostrictive Material – Magneto structure Material – Shape Memory Alloys – Electro rheological Fluids– Electromagnetic actuation – Role of actuators and Actuator Materials

CHAIRMAN

BoS (CIVIL)

Signal Processing and Control for Smart Structures - Sensors for Civil Engineering Structures - Damage detection using sensors - Smart Buildings -Smart Building components such as smart windows - Advancements in recent technologies.

TOTAL: 45 PERIODS

OUTCOMES:

On Successful completion of this course, the students will be able to:

- Identify the various types of Smart material.

- Use the measuring techniques using smart materials for solving civil engineering problems

- Select suitable sensors for analyzing and measuring various parameters

- Choose and adapt the different actuator material in structural components

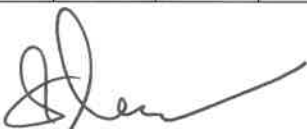- Apply signal processing and control system in smart structures

TEXT BOOKS:

1. A.S. Mosallam," Civil Engineering, Material and Smart Buildings", Springer,2024.
2. Bing Wang, Lik Lee, Qin Yang, "Advances in Smart Materials and Structures", MDPI,2023.

REFERENCES:

1. Bing Wang, Advances in Smart Materials and Structures, MDPI AG,2023.
2. L. S. Srinath, Experimental Stress Analysisǁ, Tata McGraw-Hill, 1998.
3. J. W. Dally & W. F. Riley, Experimental Stress Analysisǁ, Tata McGraw-Hill, 1998.

Mapping of COs with POs and PSOs

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

CHAIRMAN

BoS (CIVIL)

24CE804PE	APPLICATIONS OF REMOTE SENSING	L	T	P	C
	AND GIS IN CIVIL ENGINEERING	3	0	0	3

OBJECTIVES:

The student should be made to:

- Interpret the principles of photogrammetry and remote sensing.
- Explain sensors and satellites with recent applications.
- Discuss the concepts and fundamentals of satellite remote sensing.
- Impart the knowledge of remote sensing in water resource applications.
- Summarize the uses of remote sensing in transportation and environmental engineering

UNIT I ELEMENTS OF REMOTE SENSING & PHOTOGRAMMETRY   9

Principles of remote sensing - components of Remote Sensing - Energy source and electromagnetic radiation- Electromagnetic spectrum- Energy interaction- Spectral response pattern of earth surface features - Energy recording technology. principle and types of aerial photographs - Stereoscopy- Scale of a vertical aerial photograph - map Vs aerial photographs - mosaic - ground control - parallax measurements for height. Basic concepts and foundation of remote sensing.

UNIT II REMOTE SENSING TECHNOLOGY   9

Classification of Remote Sensing Systems - Aerial photographs - Photographic systems - Across track and along track scanning- Multispectral remote sensing - Thermal remote sensing - Microwave remote sensing - Active and passive sensors- RADAR - LIDAR

UNIT III SATELLITE REMOTE SENSING   9

Satellites and their sensors - satellite orbits- Indian space programme - Research and development - ISRO satellites - LANDSAT- ERS- SPOT- TERRA and NOOA satellite series - Characteristics of Remote Sensing data - Satellite data Products

UNIT IV WATER RESOURCES APPLICATIONS   9

Land use/Land cover - Rainfall – Runoff relations and runoff potential indices of watersheds - flood and drought impact assessment and monitoring. Watershed management for sustainable development and watershed characteristics – Reservoir sedimentation - Identification of suitable sites for ground water & identification of sites for artificial recharge structures- drainage morphometry- water depth estimation and bathymetry.

CHAIRMAN
BoS (CIVIL)

UNIT V ENVIRONMENTAL AND TRANSPORTATION ENGINEERING APPLICATIONS
9

Air pollution – detection & identification of pollution sources of water – water quality mapping & monitoring- environmental impact assessment – highway alignment-urban planning and infrastructure development

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course- the students will be able to:

- Illustrate the remote sensing and Photogrammetry principle, Elements.
- Apply the various type remote sensing technology in various Projects.
- Utilize satellite sensing systems for different environmental issues.
- Develop remote sensing technologies in water resource applications.
- Analyze the applications of remote sensing in transportation and environmental engineering

TEXT BOOKS:

1. Lillesand, T. M. and Kiefer, R.W, "Remote sensing and image interpretation", John Wiley and sons, New York,2018.
2. Golfried Konechy, "Geoinformation Remote sensing- Photogrammetry and Geographical Information Systems", CRC press- 1st Edition, 2017.

REFERENCES:

1. Burrough, P.A. and McDonnell, R.A., "Principles of Geographic Information systems" Oxford University Press, New York, 2017.
3. C.P. Lo Albert, K.W. Yonng, "Concepts & Techniques of GIS", 2nd Edition, Prentice Hall (India) Publications, 2008.

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

L	T	P	C
3	0	0	3

OBJECTIVES:

The students should be made to:

- Understand the fundamentals of IoT and AI and their significance in civil engineering applications.
- Interpret IoT-based technologies for monitoring and managing civil projects.
- Explain AI techniques for construction management, predictive maintenance, and design optimization.
- Summarizes IoT and AI for sustainable development, disaster management, and smart infrastructure solutions.
- Identify challenges and explore future trends of IoT–AI in civil engineering projects.

UNIT I   ARTIFICIAL INTELLIGENCE   9

Artificial Intelligence (AI)-Definition-Development of AI-Types of AI-Application of AI of Civil Engineering -Uncertainty towards Learning Systems-Optimisation –AI techniques.

UNIT II   ARTIFICIAL NEURAL NETWORK AND APPLICATIONS OF
ANN IN CIVIL ENGINEERING   9

Artificial Neural Networks-Basics of ANN–Topology-Learning Processes-Supervised and unsupervised learning - Least mean square algorithm-Structural Properties-Feed forward ANN-Back Propagation-Advantages of ANN- Structural Design problems in ANN-Optimisation-ANN in Water Conservation-ANN in Geotechnical Engineering- Prediction of dynamic behaviour of piles.

UNIT III   FUZZY LOGIC AND APPLICATIONS   9

Introduction of Fuzzy logic -Fuzzy sets -Fuzzy Relations-Fuzzy rule and decision making-hybrid soft computing– Neuro Fuzzy-Application of Fuzzy-Durability of self-Compacting Concrete-Reservoir Operation-Neuro fuzzy application in pavement and performance.

CHAIRMAN
BoS (CIVIL)

UNIT IV   INTERNET OF THINGS   9

Introduction–Internet of Things (IoT)-IoT Enabling Technologies-Domain Specific IoT-Smart Parking-Smart Lighting-Smart Roads-Structural Health Monitoring-Surveillance-Emergency response-weather monitoring-air pollution monitoring-Noise pollution monitoring-Forest fire detection-River flood detection-Route generation and Scheduling-Smart irrigation.

UNIT V   GENETIC ALGORITHM   9

Introduction-Biological Background - Genetic algorithm (GA) vs traditional algorithm-Basic Terminologies in GA - Advantages and limitations of GA-Applications of GA-water distribution network-Construction Scheduling - Irrigation planning

TOTAL: 45 PERIODS

OUTCOMES:

On Successful completion of this course, the students will be able to:

- Explain the fundamentals of IoT and AI and their role in civil engineering.
- Summarizes IoT-based systems for structural health monitoring and smart infrastructure.
- Develop AI techniques for construction management, design optimization, and predictive maintenance.
- Apply IoT and AI for smart cities, disaster management, and sustainable development.
- Analysis challenges, limitations, and future trends of IoT and AI in civil engineering.
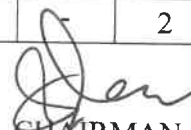
TEXT BOOKS:

1. S. Mambretti, D. Proverbs "Urban Water Systems & Floods III", WIT Press, 2020.
2. Stefano Mambretti, David Proverbs, "Urban Water Systems & Floods IV", WIT Press,2022.

REFERENCES:

1. Chris Zevenbergen, et.al., "Urban Flood Management", CRC Press; 1st edition,2010.
2. Jonathan N. Parkinson, et al., "Integrated Urban Water Management", CRC Pvt Limited, 1st edition,2010.
3. Jorge Leandro, James Shucksmith, "Modelling of Floods in Urban Areas", MDPI AG,2022.

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

24CE806PE   **SMART CITIES AND INFRASTRUCTURE**   L   T   P   C

                                                                3   0   0   3

OBJECTIVES:

The student should be made to:

- Understand concept, evolution, and interpretations of smart cities and their role in urban development.
- Interpret planning and management of urban physical infrastructure in the context of smart city initiatives.
- Analyze the economic, social, and cultural dimensions in shaping smart cities.
- Explore ecological, environmental, and energy-related aspects in designing sustainable and resilient smart cities.
- Gain knowledge about the Smart Cities Mission in India, its projects, policies, and technology-driven implementation.

UNIT I   INTRODUCTION TO SMART CITIES   9

Origin of the term smart cities-Different interpretations of smart cities-Evolution of the term till today-overview of smart cities - integrating physical planning effectively with other parameters - economy-infrastructure of various types-energy-climate change-urban governance- social aspects- mobility- quality of life- ICT- GIS and remote sensing as tools to enable smart cities.

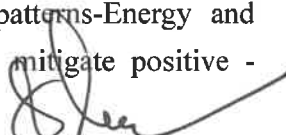**UNIT II   URBAN PHYSICAL INFRASTRUCTURE AND SMART CITIES   9**

Different types of urban infrastructure – sewage- water- electricity and lighting- mobility of people and goods- parking-Case studies- integrated approach.

UNIT III ECONOMIC, SOCIAL AND CULTURAL ASPECTS AND SMART CITIES 9

Smart city concepts and city economy- Urban governance and smart city- Smart city concepts in slum area development- Historic core regeneration-preservation and smart city-Case studies for each.

UNIT IV   ECOLOGY, ENERGY AND SMART CITY   9

Geography of the city-Ecological aspects-Climate change-Flooding patterns-Energy and Sustainability in cities- Incorporating smart concepts to enhance and mitigate positive - negative effects -Case studies.

CHAIRMAN
BoS (CIVIL)

Smart cities in the context of India-Urban projects in India- JNNURM, Smart city mission-Detailed case studies with focus on technology -enabling mechanism.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On Successful completion of this course, the students will be able to:

- Interpret concept, evolution, and multidisciplinary nature of smart cities.
- Outline ICT, GIS, and remote sensing tools in urban planning for effective integration of infrastructure and services.
- Demonstrate case studies of urban infrastructure, governance, and cultural preservation in the context of smart cities.
- Apply ecological challenges, climate change impacts, and energy sustainability strategies in urban environments.
- Analyze Indian smart city projects (JNNURM, Smart City Mission)

TEXTBOOKS:

1. Mani.N, "Smart Cities and Urban Development in India", New Century Publications,2016.
2. Binti Singh & Manoj Parmar, "Smart City in India", Routledge, 2020.

REFERENCES:

1. Mohammad S. Obaidat & Petros Nicopolitidis, "Smart Cities and Homes" Morgan Kaufmann 2016.
2. Poonam Sharma, Swati Rajput, "Sustainable Smart Cities in India", Springer 2019.
3. Ricardo Armentano, Parag Chatterjee et al, "The Internet of Things" CRC Press, Taylor and Francis, 2018.

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)

24CE807PE   COMPUTER APPLICATIONS IN CIVIL ENGINEERING   L   T   P   C

                                                                          3   0   0   3

OBJECTIVES:

The student should be made to:

- Understand the role of IT applications in construction management and project planning.

- Infer optimization techniques with various software applications.

- Interpret fuzzy logic, neuro-fuzzy systems, and their applications in civil engineering.

- Summarize genetic algorithms and their use in scheduling, resource planning, and infrastructure management.

- Outline advanced scheduling techniques (PERT, CPM, ERP, simulation) using computer applications.

UNIT I   INTRODUCTION   9

Overview of IT Applications in Construction – Construction process – Computerization in Construction – Computer aided Cost Estimation – Developing application with database software.

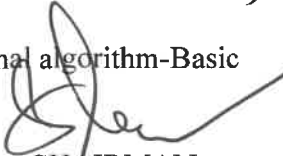**UNIT II   OPTIMIZATION TECHNIQUES   9**

Linear- Dynamic and Integer Programming - Branch and Bound Techniques – Application to Production Scheduling-Equipment Replacement-Material Transportation and Work Assignment Problems – Software applications

UNIT-III   FUZZY LOGIC AND APPLICATIONS   9

Introduction of Fuzzy logic-Fuzzy sets-Fuzzy relations-Fuzzy rule and decision making hybrid soft computing–Neuro fuzzy-Application of Fuzzy-Durability of self Compacting concrete-Reservoir operation-Neuro fuzzy application in pavement and performance.

UNIT-IV   GENETIC ALGORITHM (GA)   9

Introduction-Biological background-Genetic algorithm (GA) vs Traditional algorithm-Basic

CHAIRMAN
BoS (CIVIL)

Terminologies in GA- Advantages and limitations of GA-Applications of GA-water distribution network-Construction Scheduling- Irrigation planning.

UNIT-V   SCHEDULING APPLICATION   9

PERT and CPM - Advanced planning and scheduling concepts – Computer applications – Case study-Sequencing problems – Simulation – Enterprises – Introduction to ERP systems-STAAD Pro, ETAB and Excel Macros.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On Successful completion of this course, the students will be able to:

- Illustrate IT tools and database software for construction cost estimation and management.

- Demonstrate optimization problems related to scheduling, equipment, and material management.

- Develop fuzzy logic and hybrid soft computing methods to model uncertainties in civil engineering projects.

- Construct genetic algorithms to solve complex problems in water distribution, irrigation, and scheduling.

- Analyze project schedules using PERT, CPM, ERP systems, and simulation techniques.
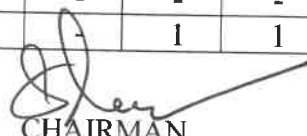
TEXT BOOKS:

1. S M Yadav "Application of soft computing techniques in Civil Engineering", MV learning, Indi, 2018.
2. Sivanandam S N and Deepa S N "Principles of Soft computing" Second Edition, Wiley, USA 2011.

REFERENCES:

1. Feigenbaum, L"Construction Scheduling with Primavera" Project Planner Prentice Hall Inc., 2002.
2. Ming Sun and Rob Howard, "Understanding I.T. in Construction" Spon Press, Taylor and Francis Group, 2004.
3. Tarek Hegazy, "Computer-Based Construction Project Management" Pearson New International Edition, 2013.

Mapping of COs with POs and PSOs

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

CHAIRMAN
BoS (CIVIL)