SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE
(AUTONOMOUS)
(Approved by AICTE, New Delhi, Affiliated to JNTUK, Kakinada)
Accredited by NAAC with 'A+' Grade
Recognised as Scientific and Industrial Research Organisation
SRKR MARG, CHINA AMIRAM, BHIMAVARAM – 534204 W.G.Dt., A.P., INDIA

Regulation: R23	

CIVIL ENGINEERING (Minors)

(Applicable for AIDS, AIML, CIC, CSBS,CSE, CSG,CSIT, ECE, EEE, IT&ME)

COURSE STRUCTURE
(With effect from 2023-24 admitted Batch onwards)

Course Code	Course Name	Year/ Sem	Cr	L	T	P	C.I.E	S.E.E	Total Marks
B23CEM101	Surveying	II-II	3	3	0	0	30	70	100
B23CEM201	Building Materials & Construction Technology	III-I	3	3	0	0	30	70	100
B23CEM301	Environmental Engineering	III-II	3	3	0	0	30	70	100
B23CEM401	Transportation Engineering	IV-I	3	3	0	0	30	70	100
B23CEM501	*MOOCS-I	II-II to IV-I	3	--	--	--	--	--	100
B23CEM601	*MOOCS-II	II-II to IV-I	3	--	--	--	--	--	100
	TOTAL		18	12	0	0	120	280	600

*Two MOOCS courses of any CIVIL ENGINEERING related Program Core Courses from NPTEL/SWAYAM with a minimum duration of 12 weeks (3 Credits) courses other than the courses offered need to be takenby prior information to the concern. These courses should be completed between II Year II Semester to IV Year I Semester.

Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CEM101	Minors	3	--	--	3	30	70	3 Hrs.

SURVEYING

(Minor Degree Course in CE)

Course Objectives: The objectives of this course is to make the student aware of

1.	Principle and methods of surveying
2.	Measuring horizontal and vertical-distances and angles. Perform calculations based on the observation.
3.	Identifying source of errors and rectification methods
4.	Surveying principles to determine areas and volumes and setting out curves
5.	Modern surveying equipment's for accurate results

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

S.No	Outcome	Knowledge Level
1.	**Apply** Principles and methods of surveying for measuring the distances and angles using instruments.	K3
2.	**Determine the** levels for the contouring along with areas and volumes.	K3
3.	**Determine** the working principles of Theodolite and measurement of horizontal and vertical angles along with identifying source of errors and rectification methods.	K3
4.	**Determine the** principles of tacheometry and setting of curves.	K3
5.	**Use** modern surveying techniques and instruments for accurate results.	K3

SYLLABUS

UNIT-I (10Hrs)	**Introduction and Basic Concepts:** Introduction, Objectives, classification and principles of surveying, Surveying accessories. Introduction to Compass, leveling and Plane table surveying. **Linear distances-** Approximate methods, Direct Methods- Chains- Tapes, ranging, Tape corrections. **Prismatic Compass**- Bearings, included angles, Local Attraction, Magnetic Declination, and dip –systems and W.C.B and Q.B systems of locating bearings.
UNIT-II (10 Hrs)	**Leveling-** Types of levels, methods of levelling, and Determination of levels, Effect of Curvature of Earth and Refraction. **Contouring-** Characteristics and uses of Contours, methods of contour surveying. **Areas -** Determination of areas consisting of irregular boundary and regular boundary. **Volumes -**Determination of volume of earth work in cutting and embankments for level section, capacity of reservoirs.

UNIT-III **(10 Hrs)**	**Theodolite Surveying:** Types of Theodolites, temporary adjustments, measurement of horizontal angle by repetition method and reiteration method, measurement of vertical Angle, Trigonometrical leveling when base is accessible and inaccessible. **Traversing:** Methods of traversing, traverse computations and adjustments, Introduction to Omitted measurements
UNIT-IV **(10 Hrs)**	**Tachometric Surveying**: Principles of Tachometry, stadia and tangential methods of Tachometry **Curves:** Types of curves and their necessity, elements of simple, compound, reverse curves
UNIT-V **(10 Hrs)**	**Modern Surveying Methods:** Principle and types of E.D.M. Instruments, Total station-advantages and Applications. Introduction to Global Positioning System. Introduction to Drone survey and LiDAR Survey (Light Detection And Ranging). **Photogrammetry Surveying:** Introduction, Basic concepts, perspective geometry of aerial photograph, relief and tilt displacements, terrestrial photogrammetry, flight planning; Stereoscopy, Photographic mapping- mapping using paper prints, mapping using stereo-plotting instruments, mosaics, map substitutes.

Textbooks:

1.	Surveying (Vol – 1 & 2) by Duggal S K, Tata McGraw Hill Publishing Co. Ltd. New Delhi, 5th edition, 2019
2.	Textbook of Surveying by *C Venkatramaiah , Universities Press 1st Edition, 2011*

Reference Books:

1.	Surveying (Vol – 1), by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi, 18th edition 2024
2.	Surveying (Vol – 3), by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi 16th 2023
3.	Plane Surveying and Higher Surveying by Chandra A M, New age International Pvt. Ltd., Publishers, New Delhi, 3rd Edition, 2015
4.	Surveying and Levelling by N. Basak Tata McGraw Hill Publishing Co. Ltd. New Delhi, 4th edition, 2014
5.	Surveying (Vol 1, 2 & 3), by Arora K R, Standard Book House, Delhi. Edition: 12th, 2015

e-Resources

1.	https://nptel.ac.in/courses/105107122
2.	https://archive.nptel.ac.in/courses/105/104/105104101/

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)	R23

II B.Tech. II Semester MODEL QUESTION PAPER

SURVEYING

(Minor Degree Course in CE)

Time: 3 Hrs.	Max. Marks: 70 M

Answer Question No.1 compulsorily

Answer **ONE Question** from **EACH UNIT**

Assume suitable data if necessary

10 x 2 = 20 Marks

			CO	KL	M
1.	a).	Define surveying and list out its various classification.	1	1	2
	b).	Convert the following WCB into RB (a)$112^o04'$ (b)$339^o42'$.	1	2	2
	c).	Explain various methods of interpolating the contours.	2	2	2
	d).	Define the Simpsons rule.	2	1	2
	e).	Explain in detail about 3 main parts of theodolite.	3	2	2
	f).	Explain in detail about most accurate method in traversing.	3	2	2
	g).	Explain the limitations of tacheometry.	4	2	2
	h).	Explain about types of curves in surveying.	4	2	2
	i).	Define photogrammetry? Write its significance/uses in surveying.	5	1	2
	j).	Explain the following: 1)Vertical Photograph 2)Camera axis	5	2	2

5 x 10 =50Marks

		UNIT-1			
2.	a).	Explain in detail about the principles and classifications of surveying	1	2	5
	b).	A 30m chain used for a survey was found to be 30.10m at the beginning and 30.30m at the end of the work. The area of the plan drawn to a scale of 1cm=8m was measured with the help of a planimeter and was found to be 42.56 sq.cm. find the true area of the field.	1	3	5
		OR			
3.	a).	Explain different tape corrections to applied for measured length?	1	2	5
	b).	A closed compass traverse ABCDE was run and observed bearings of the lines were obtained as under. Calculate and correct the bearings for local attraction. 	Line	FB	BB
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AB	$75^o45'$	$252^o00'$
BC	$349^o00'$	$167^o15'$
CD	$298^o30'$	$118^o30'$
DE	$299^o00'$	$48^o00'$		1	3	5

			EA	135°30'	319°00'			
			UNIT-2					
4.	**a).**	Explain in detail about temporary and permanent adjustments of level.				2	2	5
	b).	Explain about the characteristics and uses of contours.				2	2	5
			OR					
5.		The following perpendicular offsets were taken at 10 meters intervals from a survey line to an irregular boundary line:3.25,5.60,4.20,6.65,8.75,6.20,3.25,4.20,5.65. Calculate the area enclosed between the survey line, the irregular boundary line and the first and last offsets, by the application of a) average ordinate rule b) trapezoidal rule c) Simpsons rule				2	3	10
			UNIT-3					
6.	**a).**	Determine the horizontal angle by using the repetition method.				3	3	5
	b).	Determine the vertical angle by using the trigonometrical levelling when the base is in accessible.				3	3	5
			OR					
7.	**a).**	Explain any one method of balancing the traverse in detail.				3	3	5
	b).	The following measurements were made in a closed traverse ABCD: AB=97.54m; CD:170.69m; DA=248m; <DAB=70°45′ <ADC=39°15′.Calculate the missing measurements.				3	3	5
			UNIT-4					
8.	**a).**	Determine the general tacheometric equation.				4	3	5
	b).	A tacheometer was setup at a station 'A' and the readings on a vertically held staff at 'B' were 2.255, 2.605, and 2.955, the line of sight being at a inclination of +8°24′.another observation on the vertically held staff at B.M gave the readings 1.640,1.920 and 2.200 , the inclination of the line of sight being +1°06′.calculate the horizontal distance between A and B, and the elevation of B if the RL of B.M is 418.685 meters. The constants of instruments are 100 and 0.3.				4	3	5
			OR					
9.	**a).**	Determine the elements of simple curve.				4	3	5
	b).	Calculate the ordinates at 10 meters distances for a circular curve having a long chord of 80 meters and a versed sign of 4m.				4	3	5
			UNIT-5					
10.	**a).**	Explain the global positioning system with a neat diagram.				5	2	5
	b).	Explain about the drone survey and LiDAR Survey.				5	2	5
			OR					
11.	**a).**	Illustrate an expression to find the scale of a vertical photograph.				5	2	5

	b).	Explain with reference to a real photographs, what is meant by end overlap and side overlap and why they are provided?	5	2	5

CO-COURSE OUTCOME   KL-KNOWLEDGE LEVEL   M-MARKS

NOTE: Questions can be given as A, B splits or as a single Question for 10 marks

Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CEM201	**Minors**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

BUILDING MATERIALS AND CONSTRUCTION TECHNOLOGY
(Minor Degree Course in CE)

Course Objectives: The objectives of this course is to make the student aware of

1.	Various building materials and assess their structural suitability for construction.
2.	The importance of cement and lime in construction processes, focusing on their significance in enhancing structural integrity and durability.
3.	The properties and applications of sustainable and smart building materials for innovative, eco-friendly construction.

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

S.No	Outcome	Knowledge Level
1.	**Interpret** the quality of stones, bricks and clay products.	K2
2.	**Explain the** function of various materials like wood, glass, paints and building components.	K2
3.	**Interpret** the properties of lime, cement, and aggregates and their use in concrete production.	K2
4.	**Illustrate** the importance of masonry, finishing and form woks.	K2
5.	**Explain** various sustainable and smart building materials	K2

SYLLABUS

UNIT-I (10Hrs)	**Building Stones, Bricks and Tiles** **Stone**-Building stones, classification of building stones, quarrying procedures, characteristics of good building stone. **Bricks**-Composition of brick earth, manufacturing of brick, characteristics of good brick, field and lab test. **Tiles** -Types of tiles, manufacturing of tiles, structural requirements of tiles.
UNIT-II (8 Hrs)	**Wood, Glass, Paints** **Wood**- structure, types of wood, properties of wood, seasoning, defects, alternative material for wood. **Glass**-types of glasses, manufacturing of glass. **Paints** -Constituents of paints, types of paints.
UNIT-III (12 Hrs)	**Lime , Cement and Aggregates** **Lime**: Various ingredients of lime – Constituents of lime stone – Classification of lime – various methods of manufacture of lime. **Cement**: Portland cement- Chemical Composition – Hydration, setting and fineness of cement. Various types of cement and their properties. Various field and laboratory tests for

	Cement
	Aggregates Classification of aggregate - particle shape and texture – Bond and Strength of aggregate – Specific gravity – Bulk Density, porosity and absorption – Moisture content of Aggregate- Bulking of Sand
UNIT-IV (8 Hrs)	**Masonry and Finishing, Form Works** **Brick Masonry**- Types and bonds. Stone Masonry- Types. **Finishing**- plastering, pointing and cladding- Types of ACP (Aluminum composite panel). **Form Works** - requirements, standards, Scaffolding, shoring and under pinning.
UNIT-V (10 Hrs)	**Sustainable and Green Advanced Building Materials** Introduction – Advanced building materials, Light transmitting bricks, Mycelium composite bricks, Bioluminous paints, living bricks for carbon sequestration, Ecobind tiles, CO_2 absorbing concrete **Smart Building Materials** Introduction – Characteristics of smart materials in comparison to common architectural materials, Types of smart materials and their applications.

Textbooks:

1.	"EngineeringMaterials"[MaterialScience],byRangwala,,CharotarPublications"
2.	"Building Materials" by S.K.Duggal New Age International Publishers.

Reference Books:

1.	"Engineering Materials",5th edition, by Surindra Singh, Konark Publishers Pvt. Ltd., New Delhi.
2.	"Civil Engg. Materials" by Technical Teachers" Training Institute, Chandigarh, Tata- McGraw-Hill Publishing Company Ltd., New Delhi.
3.	"Materials of construction", by R.C.Smith, McGraw-Hill Company, New York.
4.	Engineering Materials", by Sushil Kumar, Metropolitan Book Co., Pvt. Ltd, New Delhi
5.	Building Construction" Vol.II & III by W.B. Mckay, E.L.B.S. and Longman, UK.
6.	Gajanan M. Sabnis, 2016, Green Building With Concrete Sustainable Design and Construction, CRC Press

e-Resources

1.	https://archive.nptel.ac.in/courses/105/102/105102088/
2.	https://archive.nptel.ac.in/courses/124/105/124105013/
3.	https://archive.nptel.ac.in/courses/105/106/105106206/
4.	https://onlinecourses.nptel.ac.in/noc24_ar20/preview

					Course Code: B23CEM201

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)	**R23**
III B.Tech. I Semester MODEL QUESTION PAPER	
BUILDING MATERIALS AND CONSTRUCTION TECHNOLOGY	
(Minor Degree Course in CE)	

Time: 3 Hrs.	**Max. Marks: 70 M**

Answer Question No.1 compulsorily
Answer **ONE Question** from **EACH UNIT**
Assume suitable data if necessary

	10 x 2 = 20 Marks		

			CO	KL	M
1.	**a).**	Describe the qualities of good building stones	1	2	2
	b).	Explain the purpose and characteristics of Mangalore tiles	1	2	2
	c).	Differentiate between paint, varnish, and distemper	2	2	2
	d).	Discuss the process and importance of seasoning timber	2	2	2
	e).	Explain the various uses of lime	3	2	2
	f).	Describe the significance of sieve analysis in construction.	3	2	2
	g).	Explain the different types of bonds used in brick masonry.	4	2	2
	h).	Explain the function of pointing and cladding in construction.	4	2	2
	i).	Explain the applications of CO2-absorbing concrete in construction.	5	2	2
	j).	Differentiate between mycelium composite bricks and traditional bricks.	5	2	2
			5 x 10 = 50 Marks		
		UNIT-1			
2.	**a).**	Explain the classifications of stones and their characteristics.	1	2	5
	b).	Describe the quarrying procedures for extracting building stones and explain their role in ensuring stone quality.	1	2	5
		OR			
3.	**a).**	Describe the steps involved in the manufacturing process of a Brick?	1	2	5
	b).	Explain the characteristics and uses of roof tiles and also classify the different types of tiles	1	2	5
		UNIT-2			
4.	**a).**	Explain various details of the cross section of a tree with a neat sketch.	2	2	5
	b).	Describe various alternative materials to wood used in construction. Discuss their properties, benefits, and typical applications.	2	2	5
		OR			
5.	**a).**	Explain the properties of glass and describe the uses of glass bricks and sheet glass.	2	2	5
	b).	Describe the constituents of paints and differentiate between various	2	2	5

		types of paints.			
		UNIT-3			
6.	**a).**	Describe different constituents and their functions in ordinary Portland cement.	3	2	5
	b).	Describe different field and laboratory tests of cement.	3	2	5
		OR			
7.	**a).**	Explain about different tests conducted on aggregates?	3	2	5
	b).	Explain the various uses of different varieties of lime?	3	2	5
		UNIT-4			
8.	**a).**	List out various types of masonry? State the uses of stone masonry?	4	2	5
	b).	Explain different types of Ashlar masonry with the help of sketches?	4	2	5
		OR			
9.	**a).**	Explain briefly about formwork and scaffolding.	4	2	5
	b).	Discuss the different types of Aluminium Composite Panels (ACP) used in cladding, including their characteristics and typical applications.	4	2	5
		UNIT-5			
10.	**a).**	Explain the concept of advanced building materials and describe how light-transmitting bricks and CO_2-absorbing concrete contribute to sustainability in construction.	5	2	5
	b).	Explain the concept and benefits of bio luminous paints and Eco bind tiles.	5	2	5
		OR			
11.	**a).**	Discuss the characteristics of smart building materials and compare them with traditional architectural materials.	5	2	5
	b).	Describe the different types of smart materials and their applications in construction.	5	2	5

CO-COURSE OUTCOME   **KL-KNOWLEDGE LEVEL**   **M-MARKS**

NOTE: Questions can be given as A, B splits or as a single Question for 10 marks

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CEM301	Minors	3	--	--	3	30	70	3 Hrs.

ENVIRONMENTAL ENGINEERING

(Minor Degree Course in CE)

Course Objectives: The objectives of this course is to make the student aware of

1.	Outline planning and the design of water supply systems for a community/town/city and selection of source based on quality and quantity
2.	Impart knowledge on different sources of water pollution
3.	Design of water treatment plant for a village/city
4.	Design of sewers and plumbing system for buildings
5.	Various adverse effects of water pollution

Course Outcomes At the end of the course students will be able to

S.No	Outcome	Knowledge Level
1.	Identify and select a source based on quality and quantity and Estimate design population and water demand	K3
2.	Identify and explain the different sources of water pollution	K3
3.	Apply the principles of water treatment methods and design unit operations	K2
4.	Explain sewerage, house plumbing, preliminary and primary treatment concepts of wastewater	K3
5.	Identify and explain various effects of water pollution on living organisms	K2

SYLLABUS

UNIT-I (10Hrs)	**Water Demand and Quantity studies:** Importance and Necessity of Protected Water Supply systems, Flow chart of public water supply system, Water demand and its types, Estimation of water demand for a town or city, Types of water demands, Per capita Demand and factors affecting it, Population forecasting- arithmetic, geometric, incremental increase method, Characteristics of water- Physical, chemical and biological characteristics, BIS and WHO Guidelines for drinking water.
UNIT-II (10 Hrs)	**Different sources of water pollution:** Biological Pollution (point & non-point sources) – Chemical Pollutants: Toxic Organic & Inorganic Chemicals – Oxygen demanding substances – Physical Pollutants: Thermal Waste – Radioactive waste – Physiological Pollutants: Taste affecting substances – other forming substances
UNIT-III (10 Hrs)	**Treatment of Water:** Flowchart of water treatment plant, Treatment methods (Theory and design) - Sedimentation, Coagulation, Sedimentation with Coagulation, Filtration, Chlorination and other Disinfection methods, Softening of Water, De-fluoridation, Removal of Odours

UNIT-IV **(10 Hrs)**	**Sewerage:** Estimation of sewage flow and storm water drainage – fluctuations – types of sewers -design of circular sewers. Sewer appurtenances – cleaning and ventilation of sewers. House Plumbing - Sewage characteristics. Treatment of Sewage: Preliminary and Primary treatment units.
UNIT-V **(10 Hrs)**	**Water pollution & its control**: Adverse effects on: Human Health & Environment, Aquatic life, Animal life, Plant life — Water Pollution Measurement Techniques – Water Pollution Control Equipments & Instruments – Indian Standards for Water Pollution Control

Textbooks:	
1.	Environmental Engineering – Howard S. Peavy, Donald R. Rowe, Teorge George Tchobanoglus – Mc-Graw-Hill Book Company, New Delhi, 1985.
2.	" Environmental Engineering (Vol I) - Water Supply Engineering" – S.K.Garg, Khanna Publishers.
3.	Environmental Engineering by D. Srinivasan, PHI Learning Private Limited, New Delhi, 2011.
Reference Books:	
1.	Water Supply and Sanitary Engineering – G. S. Birdie and J. S. Birdie
2.	Water Supply and Sanitary Engineering – S.C.Rangwala
3.	Hammer and Hammer "Water and wastewater Technology", 4 th Edition, Prentice hall of India, 2003.
e-Resources	
1.	https://nptel.ac.in/courses/103107084
2.	https://archive.nptel.ac.in/courses/105/105/105105201/
3.	https://nptel.ac.in/courses/103107215

					Course Code: B23CEM301

	SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)				**R23**
	III B.Tech. II Semester MODEL QUESTION PAPER				
	ENVIRONMENTAL ENGINEERING				
	(Minor Degree Course in CE)				

Time: 3 Hrs.		**Max. Marks: 70 M**
Answer Question No.1 compulsorily		
Answer **ONE Question** from **EACH UNIT**		
Assume suitable data if necessary		
		10 x 2 = 20 Marks

			CO	KL	M
1.	**a).**	What is meant by protected water supply?	1	1	2
	b).	Name two chemical characteristics of water as per BIS standards.	1	1	2
	c).	Define thermal waste in water pollution.	2	1	2
	d).	List two examples of oxygen-demanding substances in water.	2	1	2
	e).	State the purpose of water softening in treatment processes.	3	1	2
	f).	What is defluoridation in water treatment?	3	1	2
	g).	Define storm water drainage in sewerage systems.	4	1	2
	h).	Name two types of house plumbing fixtures for wastewater.	4	1	2
	i).	State one adverse effect of water pollution on plant life.	5	1	2
	j).	What is the purpose of water quality monitoring?	5	1	2
					5 x 10 = 50 Marks
		UNIT-1			
2.	**a).**	Explain the types of water demand in a community water supply system.	1	2	5
	b).	Describe the factors to consider when selecting a water source for a town's supply system.	1	2	5
		OR			
3.	**a).**	Discuss the importance of WHO guidelines for drinking water quality.	1	2	4
	b).	Estimate the water demand for a town of 100,000 people in 2030, assuming a per capita demand of 150 liters/day and a 20% annual population increase due to industrial growth.	1	3	6
		UNIT-2			
4.	**a).**	Explain the impact of toxic organic chemicals as water pollutants, with examples of any Indian River.	2	2	4
	b).	Identify and describe three sources of radioactive waste in water bodies.	2	3	6
		OR			
5.	**a).**	Discuss the role of biological pollutants in water contamination, with	2	2	5

		examples.			
	b).	Explain the sources and effects of taste-affecting substances in water pollution.	2	2	5
		UNIT-3			
6.	a).	Describe the process of odor removal in water treatment and its significance.	3	2	5
	b).	Explain the principles of alternative disinfection methods (excluding chlorination) in water treatment.	3	2	5
		OR			
7.	a).	Discuss the importance of water treatment plant design for rural communities with limited operational budgets and technical expertise in operating and maintaining the treatment facilities.	3	2	4
	b).	Design a sedimentation tank for a water treatment plant treating 2 MLD of water, with a detention time of 4 hours and a surface overflow rate of 30 m³/m²/day.	3	3	6
		UNIT-4			
8.	a).	Explain the components of house plumbing systems for wastewater management.	4	2	5
	b).	Describe the primary treatment process in sewage treatment, including its objectives.	4	2	5
		OR			
9.	a).	Discuss the factors affecting sewage flow estimation in urban areas.	4	2	4
	b).	Calculate the sewage flow for a city of 50,000 people, assuming a per capita sewage generation of 120 liters/day and a peak factor of 2.5.	4	3	6
		UNIT-5			
10.	a).	Explain the adverse effects of water pollution on aquatic ecosystems.	5	2	5
	b).	Describe the role of STP's and ETP's in maintaining environmental quality.	5	2	5
		OR			
11.	a).	Discuss the impact of water pollution on animal life, with examples.	5	2	4
	b).	Identify and explain three water pollution measurement techniques used to assess water quality.	5	3	6

CO-COURSE OUTCOME   KL-KNOWLEDGE LEVEL   M-MARKS

NOTE: Questions can be given as A, B splits or as a single Question for 10 marks

Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CEM401	Minors	3	--	--	3	30	70	3 Hrs.

TRANSPORTATION ENGINEERING

(Minor Degree Course in CE)

Course Objectives: The objectives of this course is to make the student aware of

1.	Foundational knowledge on the evolution of road networks in India and familiarize students with highway classification systems and their practical relevance.
2.	The key concepts of traffic flow, pavement functions, and the engineering properties of highway construction materials.
3.	Railway infrastructure components and the role of advanced signaling and safety systems in modern railways.
4.	Design standards for airport planning, including site selection and runway layout.
5.	Knowledge on the structure and operations of ports and harbours, and the role of inland waterways in the logistics chain.

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

S.No	Outcome	Knowledge Level
1.	**Describe** the road development progression in India and comprehend the significance of various highway classification systems.	K2
2.	**Explain** traffic flow characteristics, understand the functions of pavements and describe the properties of highway materials	K2
3.	**Interpret** the functions of railway components and describe the importance of modern train protection signaling and services.	K2
4.	**Apply** standards for selecting airport sites to evaluate various components and design of a runway	K3
5.	**Explain** the functions of different ports and harbours terminal facility operations and understand the significance of inland water transport in modern logistics.	K2

SYLLABUS

UNIT-I (8 Hrs)	**Introduction:** Transportation engineering- Importance of transportation in Nation's economic development, role of transportation engineer in society. Road development in India during twentieth century and twenty first century; Highway planning- Classification of Roads; Highway Alignment; Geometric Design of highway Cross-section elements, Sight distances, Horizontal and Vertical alignment, Intersection elements.
UNIT-II (10 Hrs)	**Traffic Engineering** - Traffic characteristics, traffic signs, intersections; Highway Pavements- types, Pavement components and their functions, Highway Materials - Tests on Road aggregates and desirable properties, Bituminous binders and their properties; Highway Construction - Construction of Flexible pavements, construction of CC pavement and joints, pavement failures.

UNIT-III **(8 Hrs)**	**Railway Engineering**: Components of a permanent way and its functions - Rails, Gauges, Sleepers, Ballast, Formation, Rail fittings and fastenings - Coning of wheels - Defects in rails: creep in rails- Railway signals- importance- Modern Developments in Railways - Train protection services (Kavach).
UNIT-IV **(12 Hrs)**	**Airport Engineering:** Airport component parts, Aircraft characteristics, Airport site selection, Runway design, Runway lighting system, Basic Runway length, Orientation of Runway- Windrose diagram.
UNIT-V **(8 Hrs)**	**Dock & Harbour Engineering:** Ports: Classification, Requirements - Docks: Classification - Harbour: Classification, Requirements, Harbour Layout and Terminal Facilities - Coastal Protection Structures - Breakwaters: Classification - Signals: floating and fixed - light house and beacon-Inland Water Transport- Container transportation.

Textbooks:	
1.	Highway Engineering, Khanna, S.K., Justo, C.E.G and Veeraragavan, A, Revised 10th Edition, Nem Chand & Bros, 2017.
2.	Railway Engineering by S.C. Saxena & S. Arora. Dhanpat Rai publications
3.	Airport Planning and Design- S.K.Khanna and Arora, Nemchand Bros.
4.	Harbour, Dock and Tunnel Engineering by R Srinivasa, Charotar Book Stall

Reference Books:	
1.	Highway Engineering, Paul H. Wright and Karen K Dixon, Wiley Student Edition, Wiley India (P) Ltd., New Delhi
2.	Air Transportation Planning & design – Virendhra Kumar & Statish Chandhra – Gal Gotia Publishers (1999).
3.	Kadiyali L. R., & Lal, N.B. "Principles and Practices of Highway Engineering (including Expressways and Airport Engineering)", Khanna Publications, Delhi
4.	Railway Engineering by Rangwala
5.	Dock & Harbour Engineering by Ozha & Ozha

e-Resources	
1.	https://nptel.ac.in/courses/105105107
2.	https://nptel.ac.in/courses/105101087
3.	https://archive.nptel.ac.in/courses/105/107/105107123/

			Course Code: B23CEM401		
	SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)				**R23**
	IV B.Tech. I Semester MODEL QUESTION PAPER				
	TRANSPORTATION ENGINEERING				
	(Minor Degree Course in CE)				
	Time: 3 Hrs.		**Max. Marks: 70 M**		
	Answer Question No.1 compulsorily				
	Answer **ONE Question** from **EACH UNIT**				
	Assume suitable data if necessary				

10 x 2 = 20 Marks

			CO	KL	M
1.	**a).**	What are the objectives of highway geometric design?	1	2	2
	b).	Explain the difference between summit and valley curves?	1	2	2
	c).	Discuss the importance of the Los Angeles abrasion test?	2	2	2
	d).	List the different types of pavement failures	2	2	2
	e).	Classify Indian Railways. Discuss the advantages of railways?	3	2	2
	f).	List the different types of airports	3	2	2
	g).	What is cant deficiency? State two reasons why cant deficiency is limited.	4	2	2
	h).	Write a short note on functions of airport components	4	2	2
	i).	What is the basic difference between natural harbor and artificial harbor	5	2	2
	j).	Classify the different types of signals	5	2	2

5 x 10 = 50 Marks

		UNIT-1			
2.	**a).**	Compare Nagpur & Bombay Road Development plans.	1	2	5
	b).	Calculate the safe stopping distance for design speed of 50 kmph for two-way traffic on a two lane road. Assume coefficient of friction as 0.35 and reaction time of driver as 2.5 seconds	1	3	5
		OR			
3.	**a).**	Derive an expression for extra widening on horizontal curves.	1	2	5
	b).	Find out the length of transition curve for the following data: Radius of horizontal curve = 400m, design speed = 100 kmph, length of wheel base = 6.2m, number of lanes = 2, rainfall at the location = heavy, terrain condition = hilly, superelevation is introduced by rotating the edges with reference to center line and rate of introduction of superelevation is 1 in 150. Width of highway is 7m.	1	3	5
		UNIT-2			
4.	**a).**	Discuss the properties of bitumen in detail	2	2	5
	b).	Explain the test procedure of shape test for aggregates.	2	2	5
		OR			
5.	**a).**	Explain the step-by-step procedure for construction of Flexible	2	2	5

		pavements			
	b).	Discuss about the types and causes of pavement failures	2	3	5
		UNIT-3			
6.	**a).**	What are the possible causes of creep? What are the effects of creep? Explain the various preventive and remedial measures that can be taken.	3	2	5
	b).	What are the various rail failures? Discuss them with neat sketches.	3	2	5
		OR			
7.	**a).**	Explain the role of signaling in railway operations. What are the different types of signaling systems used, and how do they enhance safety and manage traffic on the rail network?	3	2	5
	b).	Discuss about modern Developments in Railways	3	2	5
		UNIT-4			
8.	**a).**	Describe the main components of an airport and explain the functions of each component.	4	2	5
	b).	Illustrate a typical airport layout plan with explanation of major components within the layout	4	3	5
		OR			
9.	**a).**	Explain the factors influencing the geometrical design of runways.	4	2	5
	b).	Explain the windrose diagram	4	3	5
		UNIT-5			
10.	**a).**	Discuss the different types of harbours	5	2	5
	b).	Explain the critical factors affecting site selection for a harbour.	5	2	5
		OR			
11.	**a).**	What are the navigational aids? Explain them briefly	5	2	5
	b).	Explain the imporazance of fixed signals and floating signals	5	2	5

CO-COURSE OUTCOME   KL-KNOWLEDGE LEVEL   M-MARKS

NOTE: Questions can be given as A, B splits or as a single Question for 10 marks