

# REVISED CURRICULUM FOR BATCH 2016-2020

## B.Tech Civil Engineering

### I SEMESTER

Sl. No.	Course Code	Course Title	L	T	P	C	Course Prerequisite	Version
1	LLL111	Basic English	3	0	0	3	-	1.05
2	MAT113	Differential and Integral Calculus	3	0	0	3	-	1.05
3	PHY111	Modern Physics	3	0	0	3	-	1.05
4	PHY151	Physics Lab I	0	0	2	1	-	1.05
5	CHY111	General Chemistry	3	0	0	3	-	1.05
6	CHY151	Chemistry Lab I	0	0	2	1	-	1.05
7	EEE101	Basic Electrical and Electronics Engineering	3	0	0	3	-	1.05
8	EEE151	Basic Electrical and Electronics Engineering Lab	0	0	2	1	-	1.05
9	EVS102	Environmental Science & Energy	3	0	0	3	-	1.05
10	MEE152	Workshop Practice	0/0	0/0	2 OR 4	1 OR 2	-	1.05
<b>Total credits</b>						<b>22/23</b>		



## II SEMESTER

Sl. No.	Course Code	Course Title	L	T	P	C	Course Prerequisite	Version
1	LLL123	English Proficiency and Aptitude Building-1	0	0	4	2	LLL111	1.05
2	MAT122	Matrices & Ordinary Differential Equations	3	1	0	4	MAT113	1.05
3	PHY121	Condensed Matter Physics	3	0	0	3		1.05
4	PHY141	Physics Lab II	0	0	2	1	-	1.05
5	CHY122	Nano Science and Nano Technology	3	0	0	3	CHY111	1.05
6	CHY141	Chemistry Lab II	0	0	2	1	-	1.05
7	HUM201	Psychology & Sociology	2	0	0	2	-	1.05
8	CSE101	Computer Programming and Problem Solving	3	0	0	3	-	1.05
9	CSE151	Computer Programming and Problem Solving Lab	0	0	2	1	-	1.05
10	LLL101	Universal Human Values and Ethics	3	0	0	3	-	1.05
	MEE151	Engineering Graphics	0/0	0/0	4 OR 2	2 OR 1	-	1.05
<b>Total credits</b>						<b>25/24</b>		



  
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### III SEMESTER

Sl. No.	Course Code	Course Title	L	T	P	C	Course Prerequisite	Version
1	MAT212	Vector Calculus, Functions of Complex Variable & PDE	3	1	0	4	MAT 122	1.05
2	LLL213	English Proficiency and Aptitude Building-2	0	0	4	2	LLL123	1.05
3	CLE211	Engineering Mechanics	3	0	0	3	-	1.05
4	CLE212	Engineering Geology	2	0	0	2	-	1.05
5	CLE213	Surveying	3	0	0	3	-	1.05
6	CLE214	Fluid Mechanics	3	0	0	3	-	1.05
7	CLE215	Building Materials and Technology	2	0	0	2		1.05
8	CLE252	Engineering Geology Laboratory	0	0	2	1		1.05
9	CLE253	Surveying Practices	0	0	2	1		1.05
10	CLE254	Fluid Mechanics Laboratory	0	0	2	1		1.05
11	CLP257	Civil CAD	0	0	2	1		1.05
<b>Total credits</b>						<b>23</b>		

### IV SEMESTER

Sl. No.	Course Code	Course Title	L	T	P	C	Course Prerequisite	Version
1	LLL222	English Proficiency and Aptitude Building-3	0	0	4	2	LLL213	1.05
2	MAT222	Numerical Methods	3	0	0	3		1.05
3	CLE230	Hydraulics and Hydraulics Machines	3	0	0	3	CLE214	1.05
4	CLE223	Strength of Materials	3	0	0	3	CLE211	1.05
5	CLE229	Concrete Technology	2	0	0	2	-	1.05
6	CLE227	Principles and Design of Water Supply and Treatment Systems	3	0	0	3		1.05
7	CLE231	Construction Planning and Management	3	0	0	3	-	1.05
8	MAT241	Numerical Methods lab	0	0	2	1		1.05
9	CLE243	Strength of Materials Laboratory	0	0	2	1		1.05
	CLE244	Hydraulics and Hydraulic Machines Laboratory	0	0	2	1		1.05
	CLE247	Concrete Testing Laboratory	0	0	2	1		1.05
12	CLE248	Water Analysis Laboratory	0	0	2	1		1.05
<b>Total credits</b>						<b>24</b>		



  
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### V SEMESTER

Sl. No.	Course Code	Course Title	L	T	P	C	Course Prerequisite	Version
1	LLL312	English Proficiency & Aptitude Building-4	0	0	4	2	LLL222	1.05
2	MAT311	Probability and Statistics	3	0	0	3	-	1.05
3	CLE312	Structural Analysis	3	0	0	3	CLE223	1.05
4	CLE331	Reinforced Concrete Structures	3	0	0	3	CLE229	1.05
5	CLE332	Highway Engineering	3	0	0	3	-	1.05
6	CLE333	Soil Mechanics	3	0	0	3	-	1.05
7	CLE334	Water Resources Engineering	2	0	0	2		1.05
8	MGT302	Industrial Economics & Management	3	0	0	3	-	1.05
9	CLE335	Soil Mechanics Laboratory	0	0	2	1		1.05
10	CLE356	Highway Engineering Laboratory	0	0	2	1		1.05
<b>Total credits</b>						<b>24</b>		

### VI SEMESTER

Sl. No.	Course Code	Course Title	L	T	P	C	Course Prerequisite	Version
1	LLL322	Campus to Corporate	0	0	4	2	LLL312	1.05
2	CLE321	Quantity Surveying and Estimating	2	0	0	2	-	1.05
3	CLE322	Advanced Structural Analysis	3	0	0	3	CLE312	1.05
4	CLE323	Principles and Design of Waste Water Treatment & Disposal Systems	3	0	0	3	CLE227	1.05
5	CLE324	Geotechnical Engineering	3	0	0	3	CLE315	1.05
6	CLE325	Transportation Engineering	3	0	0	3	CLE314	1.05
7	CLE373	Pollution Control and Monitoring (Elective I)	3	0	0	3	-	1.05
8	CLE341	Structural Analysis Laboratory	0	0	2	1		1.05
9	CLE342	CAD Lab-I	0	0	2	1		1.05
10	ITS318P	IT Skills in C & C++ Programming	0	0	2	1		1.05
11	ITS319P	IT Skills in Databases	0	0	2	1		1.05
<b>Total credits</b>						<b>23</b>		



  
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### VII SEMESTER

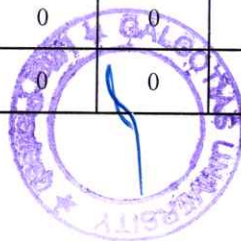
Sl. No.	Course Code	Course Title	L	T	P	C	Course Prerequisite	Version
1	CLE413	Design of Steel Structures	3	0	0	3	CLE312	1.05
2	CLE402	Air and Noise Pollution (Elective-II)	3	0	0	3		1.05
3	CLE403	Ground Water Engineering (Elective III)	3	0	0	3	-	1.05
4	CLE405	Open Channel Flow (Elective IV)	3	0	0	3	-	1.05
5	CLE466	Advanced Concrete Design (Elective V)	3	0	0	3	-	1.05
6	CLE454	CAD Lab-II	0	0	2	1		1.05
7	CLE456	Industrial Internship	-	-	-	1	-	1.05
8	CLE496	Capstone Design (Part I)	-	-	-	5	-	1.05
<b>Total credits</b>						<b>22</b>		

### VIII SEMESTER

Sl. No.	Course Code	Course Title	L	T	P	C	Course Prerequisite	Version
1	CLE499	Capstone Design (part II)	-	-	-	15	-	1.05
<b>Total credits</b>						<b>15</b>		

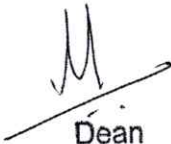
### List of elective courses

Sl. No.	Course Code	Course Title	L	T	P	C	Course Prerequisite	Version
1	CLE371	Socio-Economic Studies & EIA	3	0	0	3	-	1.05
2	CLE372	Ground Improvement Techniques	3	0	0	3	CLE324	1.05
3	CLE373	Pollution Control and Monitoring	3	0	0	3	EVS102	1.05
4	CLE374	Natural Disaster Mitigation and Management	3	0	0	3	-	1.05
5	CLE375	Engineering Hydrology	3	0	0	3	-	1.05
6	CLE376	Renewable Sources of Energy & Hydro power Engineering	3	0	0	3	-	1.05
7	CLE377	Transport Planning and Management	3	0	0	3	CLE325	1.05
8	CLE378	Traffic Engineering	3	0	0	3	CLE325	1.05
9	CLE379	Open Channel Hydraulics	3	0	0	3	CLE214	1.05
10	CLE381	Architecture and Town Planning	3	0	0	3	-	1.05
11	CLE382	Advanced Surveying	3	0	0	3	CLE213	1.05
12	CLE383	Economics and Project Finance for Civil Engineers	3	0	0	3	-	1.05
13	CLE384	Highway Pavement Design	3	0	0	3	CLE332	1.05
14	CLE385	Earthquake Engineering	3	0	0	3	-	1.05
15	CLE386	Structures on Expansive Soils	3	0	0	3	CLE333	1.05
16	CLE401	Industrial Wastes Treatment and Disposal	3	0	0	3	CLE323	1.05
17	CLE402	Air and Noise Pollution	3	0	0	3	-	1.05
18	CLE403	Ground Water Engineering	3	0	0	3	CLE334	1.05
19	CLE404	River Engineering	3	0	0	3	CLE334	1.05
20	CLE405	Open Channel Flow	3	0	0	3	CLE214	1.05
21	CLE406	Mass Transport Management	3	0	0	3	CLE325	1.05
22	CLE407	Operation and Management of Irrigation & Drainage Systems	3	0	0	3	CLE333	1.05
23	CLE408	Water Resources Systems Engineering	3	0	0	3	CLE333	1.05



  
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24	CLE409	Soil Dynamics and Machine Foundation	3	0	0	3	CLE324	1.05
25	CLE461	Advance Hydraulic Structures Design	3	0	2	3	CLE230	1.05
26	CLE462	Tunnel Engineering	3	0	0	3	CLE212	1.05
27	CLE463	Applications of Matrix Methods in Structural Analysis	3	0	0	3	CLE322	1.05
28	CLE465	Dynamics of Structures	3	0	0	3	CLE322	1.05
29	CLE466	Advanced Concrete Design	3	0	0	3	CLE331	1.05
30	CLE467	Pre Stressed Concrete Structures	3	0	0	3	CLE331	1.05
31	CLE468	Bridge Engineering	3	0	0	3	CLE331	1.05

  
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<b>CLE212</b>	<b>Engineering Geology</b>	L	T	P	C
Version1.05	Date of Approval:	2	0	0	2
Pre-requisites	--				
Co-requisites	--				

### Course Objectives

1. The overall objective of lecture portion of engineering geology is to demonstrate the importance of geology in making engineering decisions.
2. Introduce the fundamentals of engineering properties of earth materials for their use in civil engineering constructions.
3. Develop quantitative skills and frame work for solving basic engineering geology problems related to geological features and geological hazards.

### Course Outcomes

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

1. Characterize and classify various minerals and rocks on the basis of their engineering properties.
2. Assess geological hazards and develop mitigation frameworks.
3. Use seismic and electrical methods to investigate subsurface and develop a native construction plan incorporating all relevant aspects of geology.
4. Work in a multidisciplinary team to identify geological features of prospective civil engineering project sites.
5. Analyze ground water movements and deal with ground water problems.

### Catalog Description

Engineering Geology is the application of the geological sciences to civil engineering practice for the purpose of recognizing the location, design, construction, operation and maintenance of engineering works. Engineering geologists investigate and provide geologic and geotechnical recommendations, analysis and design associated with human development. The understanding of how geologic processes impact man-made structures and knowledge of methods by which to mitigate for hazards resulting from adverse natural and man-made conditions.

### Text Books

1. P.C. Varghese (2012), Engineering Geology for Civil Engineers, PHI Learning private limited. ISBN: 978-81-203-4495-2.
2. Parbin Singh, (2004), Engineering & General Geology, S.K. Kataria and Sons- Delhi. ISBN: 978-93-501-4267-7.



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## Reference Books

1. Garg. S.K. (2004), Physical and Engineering Geology, Khanna Publishers – Delhi. ISBN: 978-81-740-9032-4.
2. Jerome V. Degraff Robert B. Johnson (2011), Principles of Engineering Geology, Wiley India Pvt Ltd. ISBN: 978-81-265-3314-5.
3. Dr. D. V. Reddy (2010), Engineering Geology 1st Edition, Vikas Publishing House. ISBN: 978-81-259-1903-2.
4. Chadha S. K. (2009), Elements of Geological Maps for Geology, Geography & Civil Engineering, CBS Publishers & Distributors- New Delhi, ISBN: 978-81-239-0372-9.
5. Gautam Mahajan (2011), Evaluation and Development of Ground Water, APH Publishers. ISBN: 978-81-313-0339-9.

## Course Content

### Unit I: Minerals and Rocks

7 lecture hours

Relevance and importance of engineering geology in civil engineering, Mineral properties, composition and their use in the manufacture of construction materials, Physical and engineering properties of igneous, metamorphic and sedimentary rocks.

### Unit II: Interior and Structures of earth

6 lecture hours

Earth's interior based on seismic models, Geological maps – attitude of beds, Plate tectonics and continental drift theory, Study of earth's geological structures – fold, faults and joints, Geological factors affecting civil engineering constructions, geophysical methods – Seismic and electrical methods for subsurface investigations

### Unit III: Weathering and Soils

7 lecture hours

The atmosphere, Weather and climate, Ocean structure and composition, Rock Quality Determination (RQD) & Rock Structure Rating (RSR), Soil origin and formation, classification and its engineering importance, Slope stability, rock and soil slope stability analysis.

### Unit IV: Ground Water

6 lecture hours

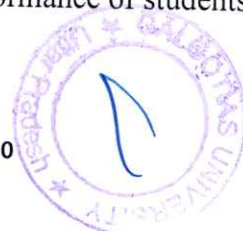
Characteristic of ground water, occurrence of ground water, Hydro geological cycle, Darcy's Law, laboratory permeability tests, Types of aquifers, Water level fluctuations, ground water investigation, Groundwater contamination, Artificial recharge of groundwater, Seawater intrusion and harvesting of rainwater.

### Unit V: Earth Processes

5 lecture hours

Resources – minerals, water & energy, Natural hazards – Brief description on cause and formation of flood, cyclone, volcano, earthquake, tsunami and landslides, Global warming and the greenhouse effect, Future of the Earth.

**Mode of Evaluation:** The theory and lab performance of students are evaluated separately.





Components	Theory	
	Internal	SEE
Marks	50	50
Total Marks	100	

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

Mapping between COs and POs		
Sl. No.	Course Outcomes (COs)	Mapped Programme Outcomes
1	Characterize and classify various minerals and rocks on the basis of their engineering properties.	7
2	Assess geological hazards and develop mitigation frameworks.	7
3	Use seismic and electrical methods to investigate subsurface and develop a native construction plan incorporating all relevant aspects of geology.	7
4	Work in a multidisciplinary team to identify geological features of prospective civil engineering project sites.	9
5	Analyze ground water movements and deal with ground water problems.	10

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning
CLE212	Engineering Geology							1		2	1		

1=addressed to small extent



<b>CLE229</b>	<b>Concrete Technology</b>	L	T	P	C
Version1.05	Date of Approval:	2	0	0	2
Pre-requisites	--				
Co-requisites	--				

### Course Objectives

1. To know the types of cement, mineral and chemical admixtures, aggregates and their Engineering properties.
2. To understand the properties and application of various special concretes.
3. To know the methodology of mix design and their application in accordance with various field conditions.

### Course Outcomes

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

1. Identify the suitability of materials for the construction works.
2. Know the various method of testing fresh and hardened concrete.
3. Design the concrete mix by various method incorporating actual site conditions.
4. Understand the importance of various concrete properties and types of concrete on sustainability.

### Catalogue Description

Concrete is one of the most vital materials used in construction. Concrete is made up of cement, coarse aggregate; fines aggregate, water and admixtures. The strength of concrete is directly depending upon the properties of these materials and their proportion in the concrete. In this course student will learn the various properties of concrete ingredients and various properties of concrete itself and their testing including non destructive testing such as ultrasonic pulse velocity test, rebound hammer test etc. They will also learn the various mix design methods to design the concrete for different construction works.

### Text Books

1. Shetty, M.S. (2010), Concrete Technology, S. Chand & Company Ltd. ISBN- 9788121900034.
2. IS: 10262-2009, Guidelines for concrete mix design proportioning, BIS, New Delhi.

### Reference Books

1. Neville. A.M. (2010) Specification of Properties of Concrete, Standard Publishers Distributors. ISBN- 9780273755807
2. Gambhir, M. L. (2012), Concrete Technology, McGraw- Hill. ISBN- 9780070151369.



## Course Content

### Unit I: Properties of cement

6 lecture hours

Cement - Different types – Properties of Cement - Testing of Cement – Field Testing – Laboratory Testing methods – Setting time of cement – soundness of cement – fineness and compressive strength of cement - Quality of water for use in concrete.

### Unit II: Fine aggregate and Admixture

6 lecture hours

Fine aggregate – Properties and testing methods – Bulking of Sand – sieve analysis – fineness modulus of sand , Chemical Admixtures- Plasticizer – super plasticizer – air entraining agents etc- Water proofers - Mineral Admixtures like Fly Ash, Silica Fume

### Unit III: Properties of concrete

6 lecture hours

Concert production, batching, mixing and transportation of concrete - water cement ratio - Properties of fresh concrete - workability – measurement of workability –Chlorination, Carbonation and Corrosion - process of manufacture of concrete. Introduction to Self-compacting concrete, Segregation and bleeding in concrete, underwater concrete,

### Unit IV: Strength of concrete

6 lecture hours

Mechanical properties of concrete – testing of hardened concrete - Compressive strength - Tensile strength – Flexural strength - Mechanical properties of concrete: elastic modulus , poisson's ratio, creep, shrinkage and durability of concrete, Non-destructive testing – ultrasonic pulse velocity test, Rebound Hammer Test etc

### Unit V: Mix Design

6 lecture hours

Concrete mix design – concept of mix design – properties related to mix design – variables in proportioning – methods of mix design – ACI method – Indian Standard method.

**Mode of Evaluation:** The subject understanding of students will be evaluated through CAT-I, II & III and Semester End Examination.

Components	Theory	
	Internal	SEE
Marks	50	50
Total Marks	100	



  
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### Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between Cos and Pos		
Sl. No.	Course Outcomes (COs)	Mapped Programme Outcomes
1	Identify the suitability of materials for the construction works.	3
2	Know the various properties of concrete and methods for their testing.	5
3	Design the concrete mix by various method incorporating actual site conditions.	3
4	Understand the importance of various concrete properties and types of concrete on sustainability.	7

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct and investigation of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning
		1	2	3	4	5	6	7	8	9	10	11	12
CLE229	Concrete Technology			3		2		2					

1=addressed to small extent

2= addressed significantly

3=major part of course



<b>CLE332</b>	<b>Highway Engineering</b>	L	T	P	C
Version1.05	Date of Approval:	3	0	0	3
Pre-requisites//Exposure	--				
Co-requisites	--				

### Course Objectives

1. To impart the knowledge in Highway Geometrics, Traffic Engineering, materials, construction and design of pavements

### Course Outcomes

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

1. Design various geometric elements of highways.
2. Understand the procedure to collect the traffic data for design and traffic management.
3. Test the highway materials as per IS/IRC guidelines.
4. Do structural design of flexible and rigid pavements.
5. Know various highway constructions techniques and its maintenance

### Catalogue Description

Highway Engineering is a prominent aspect of surface transport. With basic knowledge of materials and soil mechanics, highway engineering deals with planning, design, construction, operation and maintenance of all types of roads. During the course, the students learn all aspects of Highway Engineering in detail. Upon completion, the student shall possess the basic knowledge of Highway Engineering along with an overview of advanced concepts like multi modal transport and Intelligent Transport Systems. The students should be able to perform the basic duties of a Highway Engineer.

### Text Books

1. Khanna.S.K., and Justo. C.E.G., (2011), Highway Engineering, Ninth Edition, Nem.

### Reference Books

1. Kadiyali.L.R., and Lal.N.B., (2005), Principles and Practice of Highway Engineering, Fourth Edition, Khanna Publishers, ISBN- 9788174091659.
2. Chakroborthy Partha, and Das Animesh, (2003), Principles of Transportation Engineering, Eighth Printing, Prentice-Hall of India, ISBN-9788120320840.
3. Rao.G.V., (1996), Principles of Transportation and Highway Engineering, Tata McGraw-Hill Co, ISBN- 9780074623633.
4. Khisty.C.J., and Lall.B.K., (2003), Transportation Engineering, Indian Edition, Prentice-Hall of India, ISBN- 9788120322127.



## Course Content

### Unit I: Highway and Traffic Planning

7 lecture hours

Introduction to Transportation modes – Highway alignment and field surveys –Necessity of highway planning, Introduction to Multi-modal Transportation, Automated Transport systems, Impact of transport on environment, Highway planning in India.

### Unit II: Highway Geometrics

14 lecture hours

Importance of gemetric design, Road Geometrics – Highway cross section elements – camber – Sight Distance, Horizontal Alignment Design, Super Elevation, Extra widening, Transition curves, Set back distance, Design of Vertical curves, Gredient

### Unit III: Traffic Engineering

6 lecture hours

Traffic characteristics, road user & vehicular characteristics, traffic studies- Volume, speed, origin and destination studies, Level of service(LOS), traffic operations, traffic control devices, Intersections, Design of Intersections, Interchanges, Parking Layout & Road signs.

### Unit IV: Highway Materials and Construction

7 lecture hours

Material requirement for pavements – Soil classification for Highway – Soil tests – CBR and Plate Load Test, Aggregate – materials testing and specification, Bitumen – material testing and specification construction of bituminous and rigid pavements, Bituminous paving mixes.

### Unit V: Highway Design

9 lecture hours

Pavement Analysis – Factors affecting pavement thickness – Soil – Wheel load – Temperature – environmental factors; Flexible Pavement Design – Axle Load surveys – CBR method of Design, Rigid Pavement Design – IRC method.

**Mode of Evaluation:** The theory and lab performance of students are evaluated separately. The two performances are combined together and a final grade is awarded to the student.

Components	Theory	
	Internal	SEE
Marks	50	50
Total Marks	100	



  
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## Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between Cos and Pos		
Sl. No.	Course Outcomes (COs)	Mapped Programme Outcomes
1	Design various geometric elements of highways.	2, 3
2	Understand the procedure to collect the traffic data for design and traffic management.	3
3	Test the highway materials as per IS/IRC guidelines.	6, 9
4	Do structural design of flexible and rigid pavements.	3, 7
5	Know various highway constructions techniques and its Maintenance.	10

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct and investigation of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning
		1	2	3	4	5	6	7	8	9	10	11	12
CLE332	Highway Engineering		2	3			3	2		1	1		

1=addressed to small extent

2= addressed significantly

3=major part of course



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CLE325	Transportation Engineering	L	T	P	C
Version1.05	Date of Approval:	2	0	0	2
Pre-requisites	CLE314				
Co-requisites	--				

### Course Objectives

1. To teach the students about the different transportation systems.
2. To familiarise with various components involved in their respective modes and their basic design concepts.

### Course Outcomes

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

1. Demonstrate the ability to identify the components of railway track, their functions, alignment and the station yards.
2. Recognize and identify the requirement of an airport and the principle involved in it.
3. Learn to classify the harbours and demonstrate the ability to identify the components of a dock.

### Catalogue Description

The importance of transportation engineering is very useful in our daily life. So the basics knowledge of transportation modes are important. The basic modes are railways, aircraft etc. So we will go through the introduction, characteristics, design and safety of railway, airport, dock and harbour. The understanding of the geometrical part of the transportation is more important.

### Text Books

1. Chandra.S., and Agarwal. M.M., (2007), Railway Engineering, Oxford University Press India, ISBN- 9780195687798.
2. Rangwala.S.C., Rangwala.P.S., (2008), Airport Engineering, Charotar Publishing House Pvt. Limited, ISBN-9788185594972.
3. Oza.H.P., and Oza. G.H., (2011), Dock and Harbour Engineering, Sixth Edition, Charotar Publishing House Pvt., ISBN-9789380358383.

### Reference Books

1. Arora.S.P., and Saxena. S.C., (2001), A Textbook of Railway Engineering, Sixth Edition, Dhanpat Rai Publications.
2. Khanna.S.K., and Arora.M.G. (1971), Airport Planning and Design, Nem Chand & Bros.
3. Rangwala.S.C, (1965), Principles of Railway Engineering, Charotar Publishing house.





## Course Content

### Unit I: Introduction to Railway Engineering

9 lecture hours

Introduction to Railways in India: Role of Indian Railways in National Development; rail gauges, permanent way – functions, requirements, sections in embankment and cutting, Modern developments- LRT & MRTS, tube railways, Types of joints and fastenings.

### Unit II: Track Geometrics and Safety

9 lecture hours

Requirements of Railway alignment, vertical alignment and horizontal alignment, points and crossings – terminologies, Turnouts – Types and design aspects, Signals classification and their functions, Details of station yards and marshalling yards, Signaling, interlocking of signals and points, interlocking of tracks.

### Unit III: Introduction to airports and Aircraft Characteristics

9 lecture hours

Air transport development in India, national and international organizations in air transport, air transport activities, air crafts and its characteristics, location and planning of airport as per ICAO and F.A.A.recommendations, airport obstruction, imaginary surfaces, runway orientation clam period and wind coverage.

### Unit IV: Geometric Designs and Airport Traffic control Aids

9 lecture hours

Runway and taxiway geometric designs, exit taxiway, its design and fillet curves, runway configuration, factors affecting runway length, design of apron and their layout.

Visual aids, marking and lighting of runway and apron area, threshold limits cross section of runway

### Unit V: Docks and Harbour Engineering

9 lecture hours

classification, features, requirements, winds and waves in the location and design of harbours, break waters, jetties, landing stages & wharves, dry docks, transit sheds, cargo handling, inland water transport. Maintenance.

**Mode of Evaluation:** The subject understanding of students will be evaluated through CAT-I, II & III and Semester End Examination.

Components	Theory	
	Internal	SEE
Marks	50	50
Total Marks	100	



## Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between Cos and POs		
Sl. No.	Course Outcomes (COs)	Mapped Programme Outcomes
1	Demonstrate the ability to identify the components of railway track, their functions, alignment and the station yards.	2, 3, 12
2	Recognize and identify the requirement of an airport and the principle involved in it.	3, 6, 11, 12
3	Learn to classify the harbours and demonstrate the ability to identify the components of a dock.	6, 8, 12

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigationsof complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning
		1	2	3	4	5	6	7	8	9	10	11	12
CLE325	Transportation Engineering		1	2			2		2			1	2

1=addressed to small extent

2= addressed significantly

3=major part of course

