Department of Civil Engineering

Date 04/01/2024 & Time 11:00 am

Venu: Online Mode

CONTENTS

CONSITUTION OF BOARD OF STUDIES

Sr. No.	Nomenclature	Designation
1.	Dr.Jaspal Singh, Professor Dept. of Civil Engineering, PAU, Ludhiana	Member B.O.S.
2.	Dr. G.S. Bath, Professor, Dept. of Civil Engg., GZS Campus College of Engg. & Tech., Bathinda	Member B.O.S.
3.	Er. Inderjeet Singh Bath, Director Geomedia Engg. and Consultancy Services, Bathinda	Member B.O.S.
4.	Er. Sidhant Chopara, Alumni Dept. of Civil Engg., SBSSTC, Mohali (J.E., GLADA)	Member B.O.S.
5.	Dr. Bohar Singh, Associate Prof., Dept. of Civil Engg., SBSSU, Ferozepur	Member B.O.S.
6.	Dr. Parampreet Kaur, Assistant Prof., Dept. of Civil Engg., SBSSU, Ferozepur	Member B.O.S.
7.	Dr. Gurpreet Singh, Assistant Prof., Dept. of Civil Engg., SBSSU, Ferozepur	Member B.O.S.
8.	Dr. Dapinder Deep Singh, Assistant Prof.& Head, Dept. of Civil Engg., SBSSU, Ferozepur	Chairman

Agenda Item No. 4.1 **Confirmation of the Proceedings of 3rd meeting of Board of Studies of Dept. of Civil Engineering.**

The approved proceedings of the 3rd Meeting of Board of Studies held on 20/09/23 were circulated through mail for information and comments, if any (**Annexure-I Page No. 6**). No comments received from BOS members.

The approval of proceedings of 3rd meeting of Board of Studies are placed for conformation please.

Agenda Item No. 4.2 **To report action taken of the decisions of the 3rd meeting of Board of Studies of Dept. of Civil Engineering.**

Agenda Item No. 3.3	**Approval regarding Scheme of M. Tech. Transportation Engineering (Part-Time) 1st to 6th semester and syllabus of 1st semester of Batch 2023 and onwards of SBSSU, Ferozepur**.
Decision:	The item has been rectified as discussed and approved.
Action:	Decision Implemented.
Agenda Item No. 3.4	**Approval regarding Ph.D. course work syllabus of department of Civil Engineering.**
Decision:	The item has been rectified as discussed and approved.
Action:	Decision Implemented.

Agenda Item No. 4.3 **Approval regarding Syllabus of B.Tech. Civil Engineering 4th semester for Batch 2023 and onwards of SBSSU, Ferozepur**

The syllabus of 4th semester B.Tech. Civil Engineering Batch 2023 and onwards and open elective subjects syllabus offered by department of civil engineering is attached as (**Annexure-II, Page No. 7-25**).

This item is placed before BOS for approval please.

Agenda Item No. 4.4 **Approval regarding Scheme & Syllabus of M.Tech. Transportation Engineering (Part-Time) 2nd semester of Batch 2023 and onwards of SBSSU, Ferozepur**

The scheme and syllabus of 2nd semester of M.Tech. Transportation Engineering (Part-Time) Batch 2023 and onwards is attached as (**Annexure-III, Page No.26-31**).

This item is placed before BOS for approval please.

Annexure-I

ਸ਼ਹੀਦ ਭਗਤ ਸਿੰਘ ਸਟੇਟ ਯੂਨੀਵਰਸਿਟੀ
ਮੋਗਾ ਰੋਡ, ਫਿਰੋਜ਼ਪੁਰ-152004

SBS/FZR/CE/1982
26/9/2023

Proceedings of the 3rd meeting of Board of Studies of the department of Civil Engineering of Shaheed Bhagat Singh State University, Ferozepur, held on 20/09/2023 at 11:00 am in online mode under the Chairmanship of Dr. Dapinder Deep Singh, Head of the Department, Civil Engineering, SBSSU, Ferozepur.

The following members were present in the meeting:

1. Dr. Jaspal Singh, Professor, Dept. of Civil Engineering, PAU, Ludhiana
2. Dr. G.S. Bath, Professor, Dept. of Civil Engg., GZS Campus College of Engg. & Tech., Bathinda
3. Er. Inderjeet Singh Bath, Director, Geomedia Engg. and Consultancy Services, Bathinda
4. Er. Sidhant Chopara, Alumni Dept. of Civil Engg., SBSSTC, Mohali (J.E., GLADA)
5. Dr. Bohar Singh, Associate Prof., Dept. of Civil Engg., SBSSU, Ferozepur
6. Dr. Gurpreet Singh, Assistant Prof., Dept. of Civil Engg., SBSSU, Ferozepur

Chairman, B.O.S., welcomed the members to the 3rd meeting of Board of Studies. Thereafter the agenda of the meeting was deliberated upon and following decisions were taken unanimously:

Agenda Item No. 3.1 **Confirmation of the Minutes of 2nd Meeting of Board of Studies of Dept. of Civil Engineering.**

Decision: The minutes of 2nd Meeting of Board of Studies were confirmed.

Agenda Item No. 3.1 **To report action taken o the decisions of the 2nd meeting of Board of Studies of Dept. of Civil Engineering.**

Decision: The action taken report was approved as proposed.

Agenda Item No. 3.3 **Approval regarding Scheme of M. Tech. Transportation Engineering (Part-Time) 1st to 6th semester and syllabus of 1st semester of Batch 2023 and onwards of SBSSU, Ferozepur.**

Decision: The item was discussed in detail. Thereafter, 1st semester scheme and syllabus of M. Tech. Transportation Engineering (Part-Time) was approved after incorporating the modifications/suggestions given by B.O.S members.

Agenda Item No. 3.4 **Approval regarding Ph.D. course work syllabus of department of Civil Engineering.**

Decision: The item was discussed in detail. Thereafter, Ph.D. course work was approved after incorporating modifications/suggestions given by B.O.S members.

The meeting ended with the thanks.

Incharge Academics, Dept. of Civil Engg.,
SBSSU, Ferozepur

Submitted for approval please

Approved
20/09/23

Chairman Board of Studies
Dept. of Civil Engg.
SBS State University, Ferozepur.

Annexure-II

B.Tech. (Civil Engineering)

Scheme and Syllabus

Batch 2022and Onwards

Department of Civil Engineering

Semester 3rd									**Total Credits=24**	
Sr. No.	**Category**	**Subject Code**	**Course Title**	**Contact Hours**			**Maximum Marks**		**Total Marks**	**Credits**
				L	**T**	**P**	**Internal**	**External**		
1	Core Subject	BTCE301C	Irrigation Engineering	3	0	0	40	60	100	3
2	Core Subject	BTCE302C	Fluid Mechanics	3	1	0	40	60	100	4
3	Core Subject	BTCE303C	Solid Mechanics	3	1	0	40	60	100	4
4	Core Subject	BTCE304C	Surveying	3	0	0	40	60	100	3
5	Core Subject	BTCE305C	Fluid Mechanics Lab	0	0	2	30	20	50	1
6	Core Subject	BTCE306C	Solid Mechanics Lab	0	0	2	30	20	50	1
7	Core Subject	BTCE307C	Surveying Lab	0	0	4	30	20	50	2
8	Core Subject	BTCE308C	Computer Aided Structural Drawing Lab-I	0	0	2	30	20	50	1
9	Training/ Project	BTCE309C	Workshop Training*	0	0	2	60	40	100	2
10	Diploma Course	BTCE310C	Engineering Geology	3	0	0	40	60	100	3
Total				**15**	**2**	**12**	**380**	**420**	**800**	**24**
*Training will be imparted in the institution at the end of 2nd semester for 4 week duration.										

Semester 4th									**Total Credits=24**	
Sr. No.	**Category**	**Subject Code**	**Course Title**	**Contact Hours**			**Maximum Marks**		**Total Marks**	**Credits**
				L	**T**	**P**	**Internal**	**External**		
1	Core Subject	BTCE401C	Structural Analysis	3	1	0	40	60	100	4
2	Core Subject	BTCE402C	Transportation Engineering-I	3	0	0	40	60	100	3
3	Core Subject	BTCE403C	Environmental Engineering-I	3	1	0	40	60	100	4
4	Core Subject	BTCE404C	Design of Concrete Structures-I	3	1	0	40	60	100	4
5	Core Subject	BTCE405C	Transportation Engineering Lab	0	0	2	30	20	50	1
6	Core Subject	BTCE406C	Structural Engineering Lab	0	0	2	30	20	50	1
7	Core Subject	BTCE407C	Environmental Engineering Lab	0	0	2	30	20	50	1
8	Open Elective Course	xxxx	Open Elective Subject is chosen from the list of Open Electives offered by other departments of university.	3	0	0	40	60	100	3
9	Diploma Course	BTCE408C	Construction Machinery and Works Management	3	0	0	40	60	100	3
Total				**18**	**3**	**6**	**330**	**420**	**750**	**24**
Survey camp will be conducted after fourth semester for which viva will be conducted along with end semester examination of fifth semester.										

Semester 5th									Total Credits=21	
Sr. No.	**Category**	**Subject Code**	**Course Title**	**Contact Hours**			**Maximum Marks**		**Total Marks**	**Credits**
				L	**T**	**P**	**Internal**	**External**		
1	Core Subject	BTCE501C	Design of Concrete Structures -II	3	0	0	40	60	100	3
2	Core Subject	BTCE502C	Transportation Engineering-II	3	0	0	40	60	100	3
3	Core Subject	BTCE503C	Geotechnical Engineering	3	0	0	40	60	100	3
4	Core Subject	BTCE504C	Concrete Technology Lab	0	0	2	30	20	50	1
5	Core Subject	BTCE505C	Geotechnical Engineering Lab	0	0	2	30	20	50	1
6	Core Subject	BTCE506C	Survey Camp	0	0	2	30	20	50	1
7	Departmental Elective (Select any one)	BTCE511C	Environmental Engineering-II	3	0	0	40	60	100	3
		BTCE512C	Repair & Rehabilitation of Structures							
		BTCE513C	Environment Impact Assessment and Life Cycle Assessment							
8	Open Elective Course	xxxx	Open Elective Subject is chosen from the list of Open Electives offered by other departments of university.	3	0	0	40	60	100	3
9	Advanced Diploma Course	BTCE507C	Earthquake Engineering	3	0	0	40	40	100	3
Total				**18**	**0**	**6**	**330**	**400**	**750**	**21**

Semester 6th									Total Credits=21	
Sr. No.	Category	Subject Code	Course Title	Contact Hours			Maximum Marks		Total Marks	Credits
				L	T	P	Internal	External		
1	Core Subject	BTCE601C	Foundation Engineering	3	1	0	40	60	100	4
2	Core Subject	BTCE602C	Estimation & Costing	3	1	0	40	60	100	4
3	Core Subject	BTCE603C	Computer Aided Structural Drawing Lab-II	0	0	2	30	20	50	1
4	Departmental Elective (Select any one)	BTCE611C	Ground Improvement Techniques	3	0	0	40	60	100	3
		BTCE612C	Disaster Management							
		BTCE613C	Solid & Hazardous Waste Management							
5	Open Elective Course	xxxx	Open Elective Subject is chosen from the list of Open Electives offered by other departments of university.	3	0	0	40	60	100	3
6	Humanities & Management	xxxx		3	0	0	40	60	100	3
7	Advanced Diploma Course	BTCE604C	Air & Noise Pollution	3	0	0	40	40	100	3
Total				**18**	**2**	**2**	**270**	**360**	**650**	**21**

Semester 7th									Total Credits=21	
Sr. No.	**Category**	**Subject Code**	**Course Title**	**Contact Hours**			**Maximum Marks**		**Total Marks**	**Credits**
				L	**T**	**P**	**Internal**	**External**		
1	Core Subject	BTCE701C	Hydrology & Dams	3	1	0	40	60	100	4
2	Core Subject	BTCE702C	Design of Steel Structures	3	1	0	40	60	100	4
3	Departmental Elective (Select any one)	BTCE711C	Rural Water Supply and Onsite Sanitation Systems	3	0	0	40	60	100	3
		BTCE712C	Traffic Engineering							
		BTCE713C	Bridge Engineering							
4	Open Elective Course	xxxx	Open Elective Subject is chosen from the list of Open Electives offered by other departments of university.	3	0	0	40	60	100	3
5	Humanities & Management	xxxx		3	0	0	40	60	100	3
6	Core Subject	BTCE703C	Project	0	0	4	40	40	100	4
Total				**15**	**2**	**4**	**240**	**340**	**600**	**21**

Semester 8th(a)									Total Credits=14	
Sr. No.	Category	Subject Code	Course Title	Contact Hours			Maximum Marks		Total Marks	Credits
				L	T	P	Internal	External		
1	Core Subject	BTCE801C	Smart City	2	0	0	40	60	100	2
2	Departmental Elective (Select any one)	BTCE811C	Maintenance of Building Structures	3	0	0	40	60	100	3
		BTCE812C	Intelligent Transport System							
3	Departmental Elective (Select any one)	BTCE813C	Construction Engineering Materials	3	0	0	40	60	100	3
		BTCE814C	Pre-stressed Concrete							
4	Departmental Elective (Select any one)	BTCE815C	Soil Reinforcing Techniques	3	0	0	40	60	100	3
		BTCE816C	Groundwater Engineering							
5	Open Elective Course	xxxx	Open Elective Subject is chosen from the list of Open Electives offered by other departments of university.	3	0	0	40	60	100	3
Total				**14**	**0**	**0**	**200**	**300**	**500**	**14**

Semester 8th(b)				Total Credits=14				
Sr. No.	Category	Subject Code	Course Title	Evaluation Internal		External	Total Marks	Credits
				Institutional	Industrial			
1	Training (One Semester)	BTCE802C	Software Training#	50	50	100	200	14
			Industrial Training#	100	100	100	300	
Total				**150**	**150**	**200**	**500**	**14**
# Duration of software and industrial training are 2 and 4 months, respectively.								

List of open electives offered by Department of Civil Engineering to other departments

Sr.No.	Subject Code	Course Tile	Contact Hours			Maximum Marks		Total Marks	Credits
			L	T	P	Internal	External		
1	BTCE901C	Rock Mechanics and Engineering Geology	3	0	0	40	60	100	3
2	BTCE902C	Disaster Management	3	0	0	40	60	100	3
3	BTCE903C	Remote Sensing & GIS	3	0	0	40	60	100	3
4	BTCE904C	Construction Engineering & Management	3	0	0	40	60	100	3
5	BTCE905C	Concrete Technology	3	0	0	40	60	100	3
6	BTCE906C	Metro system and Engineering	3	0	0	40	60	100	3
7	BTCE907C	Traffic Management	3	0	0	40	60	100	3
8	BTCE908C	Road Safety	3	0	0	40	60	100	3
9	BTCE909C	Environmental Impact Assessment	3	0	0	40	60	100	3
10	BTCE910C	Air & Noise Pollution	3	0	0	40	60	100	3

Semester 4th

Sr. No.	Category	Subject Code	Course Title	Contact Hours			Credits
1.	Core Subject	BTCE401C	Structural Analysis	L	T	P	4
				3	1	0	
Internal Marks: 40, External Marks: 60, Total Marks: 100							

Course Objectives: The course should enable the students to:

1. Provide students with a solid background on principles of structural analysis by exposing them to the theories and concepts of analyzing the civil engineering structures.
2. Cover the analysis of statically determinate structures.

UNIT-I

Slope & Deflection of Beams & Frames: Review of Double Integration Method and Macaulay's Method, Moment Area Method, Conjugate Beam Method, Strain Energy / Real Work Method, Virtual Work / Unit Load Method, Castigliano's Method & Maxwell's Reciprocal Theorem.

Analysis of Determinate Trusses: Introduction, determination of forces in member of trusses by method of joints, method of sections, Tension Coefficient Method, Deflection of Joints of plane frames by Castigliano's first theorem and unit load method, Effect of Lack of Fit & Temperature Change.

UNIT-II

Simple Cable & Arch Structures: Introduction, shape of a loaded cable, cable carrying point loads and UDL, cables with ends at different level, Analysis of three hinged (Parabolic and Circular) Arches for Horizontal Thrust, Bending Moment, Normal Thrust and Radial Shear.

Suspension Bridges & Rolling Loads: Introduction, Analysis of suspension bridges with two hinged and three hinged stiffening girders, Introduction to rolling loads and influence lines.

UNIT-III

Fixed & Continuous Beams: Introduction, Analysis of fixed beams by moment-area theorem and strain energy method, fixed end moments due to different types of loadings, sinking and rotation of supports.

Approximate Methods of Structural Analysis: Introduction, Vertical and lateral load analysis of multi-storey frames, portal, cantilever and substitute-frame methods and their comparison.

UNIT-IV

Slope-Deflection Method: Introduction, slope-deflection equations.

Moment-Distribution Method: Introduction, absolute and relative stiffness of members, stiffness and carry-over factors, distribution factors.

Rotation Contribution Method: Introduction, basic concept, analysis of statically indeterminate beams and rigid frames (sway and non-sway type) due to applied loadings and yielding of supports.

Influence Lines for Statically Indeterminate Structures: Muller- Breslau principle, influence lines for reactions, shear force and bending moment for statically determine & indeterminate beams.

Course Outcomes: Upon completion of this course the student shall be able to:

1. Possess the skills to solve statically determinate problems of structural analysis dealing with different loads.
2. Apply their knowledge of structural analysis to address structural design problems.

Books Recommended :

1. Reddy, C.S. "Basic Structural Analysis".
2. Vazirani and Ratwani "Analysis of Structures", Vol. - I, -II.
3. Wang, C.K. "Intermediate Structural Analysis".
4. Punmia, B.C. "Theory of Structures".

Sr. No.	Category	Subject Code	Course Title	Contact Hours			Credits
1.	Core Subject	BTCE402C	Transportation Engineering-I	L	T	P	3
				3	0	0	
Internal Marks: 40, External Marks: 60, Total Marks: 100							

Course Objectives: The course should enable the students to:

1. Acquaint the students about highway planning and development in India.
2. Cover selection of highway alignment, design of geometric elements of highways, carry out traffic studies and implement traffic regulation and control measures and intersection design.
3. Characteristic the properties of road construction materials and design of flexible and rigid pavements as per IRC guidelines shall also be covered in this course.

UNIT-I

Highway Development and Planning: Classification of roads, road development in India, current road projects in India, highway alignment and project preparation.

Geometric Design of Highways: Highway cross section elements, sight distance, design of horizontal alignment, design of vertical alignment.

UNIT-II

Traffic Characteristics & Studies: Road user characteristics, driver characteristics, vehicular characteristics. Volume studies, speed studies, O-D survey, parking study.

Traffic Safety and Control Measures: Traffic signs, markings, islands, signals, cause and type of accidents, use of intelligent transport system.

UNIT-III

Pavement Materials: Materials used in highway construction- soils, stone aggregates, bituminous binders, desirable properties, tests, requirements for different types of pavements.

Paving Mixes: Marshall method of bituminous mix design, Super pave and Concrete mix design for rigid pavements.

UNIT-IV

Design of Pavements: Pavement types, factors affecting design and performance of pavements, flexible pavements- components and functions, stresses in flexible pavements, design of flexible pavements as per IRC.

Rigid Pavements: components and functions, stresses in rigid pavements, design of cement concrete pavements as per IRC.

Course Outcomes: Upon completion of this course the student shall be able to:

1. Learn about essentials of highway planning and features of highway development in India.
2. Learn how to do selection of highway alignment and design the geometric elements of highways.
3. Learn how to carry out traffic studies and implement traffic regulation and control measures and intersection design.
4. Know about characteristic properties of road construction materials and design the flexible and rigid pavements as per IRC guidelines.

Books Recommended :

1. Khanna, S.K., Justo, C.E.G and Veeraragavan, A "Highway Engineering", Nem Chand & Bros., Roorkee.
2. Kadiyali, L.R. "Traffic Engineering and Transport Planning", Khanna Publishers, Delhi.
3. Partha Chakraborty "Principles of Transportation Engineering", PHI Learning, New Delhi.
4. Sharma, S.K. "Principles, Practice & Design of Highway Engineering", S. Chand & Company Ltd., New Delhi.
5. Paul H. Wright and Karen K. Dixon, "Highway Engineering", Wiley Student Edition, USA.
6. C.A.O. Flaherty, "Highway Engineering", Vol. 2, Edward Arnold, London.

Sr. No.	Category	Subject Code	Course Title	Contact Hours			Credits
1.	Core Subject	BTCE403C	Environmental Engineering-I	L	T	P	4
				3	1	0	
Internal Marks: 40, External Marks: 60, Total Marks: 100							

Course Objectives: The course should enable the students to:

1. Inculcate the basics of water demand, supply, source & future demand estimation.
2. Applicability of concepts of water quality & its examinations.
3. Inculcate the basic concepts of water treatment, its design and management.
4. Extensive knowledge of sources, conversion, distribution & maintenance of water supply system.
5. Modern low cost water treatment techniques for rural supply system.

UNIT-I

Introduction: Beneficial uses of water, water demand, per capita demand, variations in demand, water demand for fire fighting, population forecasting and water demand estimation.

Water sources and development: Surface and ground water sources; Selection and development of sources; intakes and transmission systems.

UNIT-II

Pumps and pumping stations: Types of pumps and their characteristics and efficiencies; Pump operating curves and selection of pumps; pumping stations.

Quality and Examination of Water: Impurities in water, sampling of water, physical, chemical and bacteriological water quality parameters, drinking water quality standards and criteria.

UNIT-III

Water treatment: Water treatment schemes; Basic principles of water treatment; Design of Plain sedimentation, coagulation and flocculation, filtration – slow, rapid and pressure; Disinfection units; Fundamentals of water softening, fluoridation and deflouridation, water desalination and demineralization, taste and odour removal.

UNIT-IV

Water Supply Systems: Pipes for transporting water and their design, water distribution systems and appurtenances; Water supply network design and design of balancing and service reservoirs; operation and maintenance of water supply systems.

Rural water supply: Principles, selection of source, rain water harvesting, quantitative requirements, low cost treatment techniques.

Course Outcomes: Upon completion of this course the student shall be able to:

1. Design a system, component, or process to meet desired needs.
2. Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, welfare, and environmental factors.
3. Develop and conduct appropriate experimentation, analyze and interpret data for future demand & supply.

Books Recommended :

1. Punmia, B.C., Jain, A. and Jain, A. "Water Supply Engineering- Environmental Engg". (Vol. – I) Laxmi Publications, New Delhi.
2. Arcadio P., Sincero and Gregoria P. Sincero "Environmental Engg. - A design Approach" Prentice Hall of India, New Delhi
3. Garg S.K. "Water Supply Engineering" (Vol. – I) by Khanna Publishers, Delhi
4. Verma, S., Kanwar V., John, S. (2014), Water Supply Engineering, Vikas Publications, New Delhi.

Sr. No.	Category	Subject Code	Course Title	Contact Hours			Credits
1.	Core Subject	BTCE404C	Design of Concrete Structures-I	L	T	P	4
				3	1	0	
Internal Marks: 40, External Marks: 60, Total Marks: 100							

Course Objectives: The course should enable the students to:

1. Learn the behaviour of structural concrete components and Ability to perform analysis and design of concrete members.

Note:

1. **IS 456, Indian Standard. Plain and Reinforced Concrete -Code of practice is permitted in examination.**
2. **Examiner requested to provide requisite data for Mix Design Problems; if any.**

UNIT-I

Concrete Mix Design: Introduction, Selection of mix proportions, Durability of concrete, Quality Control of concrete, Introduction of various mix proportion methods, Proportioning of concrete mixes by BIS method of mix design.

UNIT-II

RCC Design Philosophies: Introduction, Objectives & methods of analysis & Design, Properties of Concrete and Steel. Philosophies of Working Stress Methods (WSM) & Limit State Method (LSM) in RCC design. **Shear, Torsion & Bond (Only Theory/Concept):** Types of shear & torsion, importance in RCC Design Structures, IS Provisions for Shear & Torsion, Bond-types of bonds, Anchorage Bond, Development length & its determination.

UNIT-III

RCC Beams: Types of beams, Behaviour in Flexure-Singly reinforced beam, Doubly reinforced beam, Flanged beam, Cantilever beam, Neutral Axis, Neutral Axis Depth, Moment of Resistance, Design of beams- Singly reinforced beam, Doubly reinforced beam, Flanged beam, Cantilever beam.

UNIT-IV

RCC Slabs: Types of slab systems, Guidelines for Design, Design of One Way and Two Way Slab.

Columns: Classifications (According to Shape, Length and Loading Conditions), Assumptions, Behaviour and Design of Axially Loaded Columns.

Course Outcomes: Upon completion of this course the student shall be able to:

1. Identify the different failure modes and determine their design strengths.
2. Select the most suitable section shape and size for beams according to specific design criteria.

Books Recommended :

1. Shetty, M.S. “Concrete Technology”, S. Chand & Co.
2. Neville, A.M. “Properties of Concrete”, Prentice Hall.
3. Gambhir, M.L. “Concrete Technology”, Tata McGraw Hill Publishers, New Delhi.
4. Pillai & Menon, “Reinforced Concrete Design”, Tata McGraw Hill Education.

Sr. No.	Category	Subject Code	Course Title	Contact Hours			Credits
1.	Core Subject	BTCE405C	Transportation Engineering Lab	L	T	P	1
				0	0	2	
Internal Marks: 30, External Marks: 20, Total Marks: 50							

Course Objectives: The course should enable the students to:

1. The main objective of this course is to give practical exposure of laboratory testing of different kinds of highway construction materials such as Soil, Aggregate and Bitumen to check their suitability for their use in road construction.
2. The knowledge of these tests is very essential for a civil engineer to choose appropriate construction material to exercise better quality control in a road construction project.

Tests on Sub-Grade Soil:

1. California Bearing Ratio Test

Tests on Road Aggregates:

1. Crushing Value Test
2. Los Angles Abrasion Value Test
3. Impact Value Test
4. Shape Test (Flakiness and Elongation Index)

Tests on Bituminous Materials:

1. Penetration Test
2. Ductility Test
3. Softening Point Test
4. Flash & Fire Point Test

Field Tests:

1. Study of Roughometer/Bump Indicator
2. Study of Benkelman Beam Method

Course Outcomes: Upon completion of this course the student shall be able to:

1. Learn the laboratory testing of different kinds of highway construction materials such as Soil, Aggregate and Bitumen.
2. Learn to check the suitability of highway construction material so as to exercise better quality control in a road construction project.

Books/Manual Recommended :

1. S.K. Khanna and C.E.G. Justo, “Highway Material & Pavement Testing”, Nem Chand and Brothers, Roorkee.
2. Ajay K. Duggal, Vijay P. Puri, “Laboratory Manual in Highway Engineering”, New Age Publications, New Delhi.

Sr. No.	Category	Subject Code	Course Title	Contact Hours			Credits
1.	Core Subject	BTCE407C	Environmental Engineering Lab	L	T	P	1
				0	0	2	
Internal Marks: 30, External Marks: 20, Total Marks: 50							

Course Objectives: The practical work should enable the students to:

1. Make the students understand the practical aspects of environmental engineering.

List of Experiments:

1. To measure the pH value of a water/waste water sample.
2. To determine optimum Alum dose for Coagulation.
3. To find MPN for the bacteriological examination of water.
4. To find the turbidity of a given waste water/water sample
5. To find B.O.D. of a given waste water sample.
6. To measure D.O. of a given sample of water.
7. Determination of Hardness of a given water sample
8. Determination of total solids, dissolved solids, suspended solids of a given water sample.
9. To determine the concentration of sulphates in water/wastewater sample.
10. To find chlorides in a given sample of water/waste water.
11. To find acidity/alkalinity of a given water sample
12. To determine the COD of a wastewater sample.

Course Outcomes: Upon completion of this practical work the student shall be able to:

1. Conduct experiments as per standard methods of sampling and analysis.
2. Demonstrate the expertise to characterize water and wastewater samples.
3. Understand the importance of laboratory analysis as a controlling factor in the treatment of water and wastewater.
4. Record the experimental observations and interpret the analysis results.

Manuals Recommended :

1. APHA (2017), Standard methods for the examination of water and wastewater.
2. Water & Waste Water Testing by Mathur, Nem Chand & Bros.
3. Manual on Sewage and Sewerage treatment by Central Public Health and Environmental Engineering Organisation (CPHEEO), GOI.
4. IS 10500: 2012, Code for Drinking Water by Bureau of Indian Standards (BIS), GOI.

Sr. No.	Category	Subject Code	Course Title	Contact Hours			Credits
1.	Diploma Course	BTCE408C	Construction Machinery and Works Management	L	T	P	3
				3	0	0	
Internal Marks: 40, External Marks: 60, Total Marks: 100							

Course Objectives: The course should enable the students to:

1. Make the students learn the basics of construction management, evaluation of a construction project, selection of construction equipment, ascertain the economic viability and financial analysis of civil engineering projects.

UNIT-I

Basics of Construction: Unique features of construction, construction projects types and features, phases of a project, agencies involved and their methods of execution.

Brief Introduction of Construction Project Planning: Stages of project planning: pre-tender planning, pre-construction planning, detailed construction planning, role of client and contractor, level of detail. Process of development of plans and schedules.

UNIT-II

Introduction: Need for project planning & management, time, activity & event, bar chart, Milestone chart, uses & draw backs.

PERT Technology: Construction of PERT network, time estimates, network analysis, forward pass & backward pass, slack, critical path, data reduction, suitability of PERT for research project.

UNIT-III

CPM Technology: Definitions, network construction, critical path, fundamental rules, determination of project schedule, activity time estimates, float types, their significance in project control.

Construction Methods Basics: Types of foundations and construction methods; Basics of Formwork and Staging; Common building construction methods (conventional walls and slabs; conventional framed structure with block work walls; Modular construction methods for repetitive works.)

UNIT-IV

Construction Equipment: Conventional construction methods VS Mechanized methods and advantages of latter; Equipment for Earthmoving, Dewatering; Concrete mixing, transporting & placing; Cranes, Hoists and other equipment for lifting; Equipment for transportation of materials. Equipment for Productivities.

Contracts Management Basics: Importance of contracts; Types of Contracts, parties to a contract; Common contract clauses (Notice to precede, rights and duties of various parties, notices to be given, Contract Duration and Price; Delays, penalties and liquidated damages; Force Majeure, Suspension and Termination. Changes & variations, Dispute Resolution methods.

Course Outcomes: Upon completion of this course the student shall be able to:

1. Understand of modern construction practices
2. Understand construction dynamics- various stakeholders, project objectives,
3. Plan, control and monitor construction projects with respect to time and cost
4. Learn how construction projects are administered with respect to contract structures and issues.

Books Recommended :

1.Varghese, P.C., "Building Construction", Prentice Hall India, 2007.
2. National Building Code, Bureau of Indian Standards, New Delhi, 2017.
3. Peurifoy, R.L. Construction Planning, Methods and Equipment, McGraw Hill, 2011
4. Jha, Kumar Neeraj., Construction Project management, Theory & Practice, Pearson Education
5. Punmia, B.C., Khandelwal, K.K., Project Planning with PERT and CPM, Laxmi Publications.

Syllabus of Open Electives offered by Department of Civil Engineering to

Other Departments.

Sr. No.	Category	Subject Code	Course Title	Contact Hours			Credits
1.	Open Elective	BTCE907C	Traffic Management	L	T	P	3
				3	0	0	
Internal Marks: 40, External Marks: 60, Total Marks: 100							

Course Objectives: The course should enable the students to:

1. Learn the basics of traffic management, regulation & control devices.

UNIT-I

Fundamentals of Traffic Management:

Principles of Traffic management; Highway capacity and Level of service; Mixed Traffic flow: PCU concept and its limitations; Traffic stream parameters: Interrupted and Uninterrupted flow.

UNIT-II

Traffic Regulation and Control devices:

Road Signs and markings; Channelization; At-grade and Grade separated intersections; Traffic Rotary; Design principles of traffic signals.

UNIT-III

Traffic Management Techniques:

Regulatory measures for Traffic management; Travel Demand Management; Role of ITS in traffic management.

UNIT-IV

Logistics for Traffic Management:

Definition, domain, role and responsibility of traffic management agencies, Principles and systems of coordination in Traffic management; Intelligent transport system- concept, Traffic Management logistics - equipment's, vehicles and traffic control centre; Centralized Data Processing and Monitoring, Traffic personnel-skills & deployment systems.

Course Outcomes: Upon completion of this course the student shall be able to:

1. Have an overall knowledge of the traffic components and assess the traffic characteristics and related problems.
2. Develop a strong knowledge base of traffic planning and its management in any transportation area.
3. Provide knowledge of traffic control devices and its techniques in transportation interaction.
4. Traffic data, traffic volume count, intersection studies and spot and journey speed studies and further to analyse them.

Books Recommended :

1. Fred, L. Mannering, Scott S. Washburn. Principles of Highway Engineering and Traffic Analysis.7th Edition, Wiley, 2019.
2. Kadiyali, L.R. "Traffic Engineering & Transport Planning". KhannaPublications,2013.
3. Khisty, C.J. and Lall B.K. "Transportation Engineering–An Introduction".3rd Edition, Pearson, 2017.
4. Khanna, S.K., Justo C.E.G and Veeraragavan A. "Highway Engineering". Revised 10 th Edition, Nem Chand Bros, 2017.

Sr. No.	Category	Subject Code	Course Title	Contact Hours			Credits
1.	Open Elective	BTCE908C	Road Safety	L	T	P	3
				3	0	0	
Internal Marks: 40, External Marks: 60, Total Marks: 100							

Course Objectives: The course should enable the students to:

1. learn the basics of road safety measures & audits.

UNIT-I

Road Accidents:

Causes of road accidents: Vehicle design factors & Driver characteristic s influencing road safety, Road condition, Parking and its influence on traffic safety

UNIT-II

Road safety measures:

Accident data collection methods; Representation of accident data: Collision and condition diagram; Methods to Identify and Prioritize Blackspots; Roadsafety:3, E-measures.

UNIT-III

Road safety audits:

Key elements in Road safety audit; Road safety audit procedure and investigations; Role of ITS in Road safety

UNIT-IV

Ensuring Traffic Safety in Road Operation:

Ensuring Traffic Safety during Repair and Maintenance, Prevention of Slipperiness and Influence of Pavement Smoothness, Restriction speeds on Roads, Safety of Pedestrians, Cycle Paths, Informing Drivers on Road Conditions with Aid of Signs, Traffic Control Lines & Guide Posts, Guardrails & Barriers and Road Lighting.

Course Outcomes: Upon completion of this course the student shall be able to:

1. Investigate & determine the collective factors and remedies of accident involved.
2. Able to collect and represent accident data to identify black spots.
3. Understand the role of intelligent transport system in Road safety.

Books Recommended :

1. K.W. Ogden, “Safer Roads – A Guide to Road Safety Engg” Averbury Technical, Ashgate Publishing Ltd., Alder shot, England, 1996.
2. Kadiyali, L.R., “Traffic Engineering and Transport Planning”, Khanna Publications, New Delhi, 2009.
3. C. Jotin Kishty & B. Kent Lall, “Transportation Engineering-An Introduction”, Third Edition, Prentice Hall of India Private Limited, New Delhi, 2006.

Annexure-III

M.Tech. Transportation Engineering (Part-Time)

Scheme and Syllabus

Batch 2023 and Onwards

Department of Civil Engineering

Semester 1st									Total Credits=9	
Sr. No.	Category	Subject Code	Course Title	Contact Hours			Maximum Marks		Total Marks	Credits
				L	T	P	Internal	External		
1.	Core Subject	MTTE-101	Advanced Traffic Engineering	3	0	0	40	60	100	3
2.	Core Subject	MTTE-102	Advanced Soil Engineering	3	0	0	40	60	100	3
3.	Department Elective	MTTE-111	Reinforced Soil Design & Construction	3	0	0	40	60	100	3
		MTTE-112	Transportation Economics & Finance)							
		MTTE-113	Transportation & Environment							
4.	Mandatory (Non-Credit)	SBS101C	Introduction to Shaheed Bhagat Singh and his co-patriots	1	0	0	S/US			
Total				**10**	**0**	**0**	**120**	**180**	**300**	**9**

Semester 2nd									Total Credits=24	
Sr. No.	Category	Subject Code	Course Title	Contact Hours			Maximum Marks		Total Marks	Credits
				L	T	P	Internal	External		
1	Core Subject	MTTE-201	Highway Construction Material and Methods	3	0	0	40	60	100	3
2	Core Subject	MTTE-202	Application of GIS in Transportation Engineering	3	0	0	40	60	100	3
3	Core Subject	MTTE-203	Pavement Materials Testing Laboratory	0	0	2	30	20	100	2
Total				**6**	**0**	**2**	**110**	**140**	**300**	**8**

Sr. No.	Category	Subject Code	Course Title	Contact Hours			Credits
				L	T	P	
1.	Core Subject	MTTE-201	Highway Construction Material and Methods	3	0	0	3
Internal Marks: 40, External Marks: 60, Total Marks: 100							

Course Objectives: The course should enable the students to:

1. To get acquainted with quality assurance, and economic selection of pavement materials.
2. To be able to perform all the necessary lab tests required to be done on highway construction materials.
3. To familiarize the fundamentals of mix design and carry out mix design.
4. To study and evaluate the applications of the recent trends in the field of highway construction materials.

UNIT-I

Sub-grade Soil Characterization: Properties of sub-grade layers; different types of soils, Mechanical response of soil; Soil Classification; Index and other basic properties of soil.

Introduction to Soil Stabilization: Physical and Chemical modification: Stabilization with admixtures like cement, lime, calcium chloride, fly ash and bitumen. Grouting: Categories of grouting, Art of grouting, Grout materials, Grouting techniques and control.

UNIT-II

Aggregate Characterization: Desirable characteristics of Road aggregates, proportioning of aggregates, Artificial aggregates, Sustainability and availability of sound aggregates.

Bitumen and Bituminous Concrete Mix Characterization: Bitumen sources and manufacturing, Chemistry of bitumen, bitumen structure, Rheology of bitumen, Elastic modulus, Dynamic modulus, visco-elastic and fatigue properties, creep test, Resilient, Diametral Resilient and Complex (Dynamic) Moduli of Bituminous Mixes.

UNIT-III

Modified bitumen and Design of Bituminous mix: Crumb Rubber Modified bitumen, Natural rubber modified bitumen, polymer modified bitumen; Introduction to emulsified bitumen and its characterization; Long term and short-term ageing and its effect on bitumen performance, Tests to simulate ageing of bitumen viz. RTFOT and PAV. Desirable properties of bituminous mixes, Design of bituminous mixes: Modified Marshall's specifications, Bituminous Road construction Procedure

UNIT-IV

Cement Concrete Pavement: Types of cements and basic cement properties, Special cements; Quality tests on cement; Tests on cement concrete including compressive strength, flexural strength, modulus of elasticity and fatigue properties; Introduction to advanced concretes like self-compacted concrete, Light weight concrete, Roller Compacted Concrete for pavement application; IS method of cement concrete mix design with case studies; Role of different admixtures in cement concrete performance; Joint filers for Jointed Plain Cement Concrete Pavements and their characterization; Nano technology applications in cement concrete, Concrete road construction.

Course Outcomes: Upon completion of this course the student shall be able to:

1. Examine the properties of the highway materials and perform Bituminous Mix Design.
2. Determine the suitability of the concrete and bituminous mixes in compliance to codal provisions.
3. Reduce cost with minimum adverse impact on environment.

Books Recommended :

1. Principles of Transportation engineering by Chakroborty & Das, Prentice Hall, India
2. Highway Engg by S.K Khanna & CEG Justo, Nem Chand Bros., Roorkee
3. Principles and practices of Highway engg by L.R Kadyali, Khanna Publishers, Delhi. Edition 6.

Sr. No.	Category	Subject Code	Course Title	Contact Hours			Credits
				L	T	P	
1.	Core Subject	MTTE-102	Application of GIS in Transportation Engineering	3	0	0	3
Internal Marks: 40, External Marks: 60, Total Marks: 100							

Course Objectives: The course should enable the students to:

1. Expose the students to the concept of digital mapping, to make them aware of recent advancements/software in surveying like Remote sensing, digital photogrammetry, GIS, DIP etc.
2. To familiarize with map projections and working with co-ordinate systems
3. To get acquainted with data analysis of vector based and raster based data

UNIT-I

Modern Trends in Surveying and Mapping: Digital Mapping, Uses and applications, data collection techniques (Conventional and Nonconventional), Present Status in India and abroad.

Aerial Photogrammetry: Introduction, types, Stereoscopy, Scale of a photograph, flight planning, Mosaics, Crab & Drift, Overlap & Sidelap.

UNIT-II

Geographical Information System (GIS): Introduction, advantages, objectives of GIS, Definitions of GIS, Components of GIS, Overlay analysis, Digital Terrain Modelling, Digital Elevation Model Applications of GIS in transportation engineering fields, Four M's, Elements of Image visualization

UNIT-III

Introduction to Remote Sensing (RS): Introduction, EM spectrum, Ideal RS System, Real RS System, Visual Image interpretation, active and passive remote sensing, Reflectance; spectral reflectance of land covers; Spectral characteristics of solar radiation; energy interaction in atmosphere; energy interactions with Earth's surface, Spectral reflectance curves, Resolution

UNIT-IV

Digital Image Processing (DIP): Introduction, Histogram and image statistics, Remote Sensing Image distortion and rectification: Radiometric errors and Geometric errors. Image Enhancement Techniques, Image classification – Supervised and Unsupervised classification, Formats

Global Positioning System: Introduction, GPS, DGPS, Applications, Software demonstrations and working GIS/RS software.

Course Outcomes: Upon completion of this course the student shall be able to:

1. Apply the concepts and analytical methods related to surveying
2. Use the various surveying equipment
3. Plan and execute surveying projects
4. Prepare a map and concepts of 3-D view
5. Identify the potential use of Remote Sensing and GIS in Civil Engineering

Books Recommended :

1. Geomatics Engineering, Manoj Arora and R C Barjatiya, Nem Chand Brothers, Roorkee.
2. Principles of GIS, Peter A. Burrough, Rachael A., Oxford University Press
3. Remote Sensing and Image Interpretation, Lillesand and Kiefer, Wiley Publishers
4. Surveying Vol. I & II, B.C. Punmia, A.K. Jain & Jain. Luxmi Publications (P) Ltd., New Delhi.

Sr. No.	Category	Subject Code	Course Title	Contact Hours			Credits
				L	T	P	
1.	Core Subject	MTTE-203	Pavement Materials Testing Laboratory	0	0	2	2
Internal Marks: 30, External Marks: 20, Total Marks: 50							

Course Objectives: The course should enable the students to:

1. Have knowledge about the various tests which need to be carried out on soils, aggregate and bitumen for the design of bituminous mixes and pavements. Evaluation tests for pavement strengthening and use of software in highway development

List of Experiments:

1. Tests on Soils (Gradation, atterberg limits, OMC and CBR).
2. Test on Aggregates (Aggregate grading and Proportioning, Impact, Abrasion crushing, water absorption, specific gravity).
3. Tests on Bitumen and Bitumen Mixes (Marshall method of mix design and Bitumen content test).
4. Pavement Evaluation tests (Benkelman beam test).
5. Exposure to latest software.

Course Outcomes: Upon completion of this course the student shall be able to:

1. Knowledge about tests and bituminous mix design which will give the students added confidence when they go actually in the field.

Books/Codes Recommended :

1. Khanna, S. K., Justo, C. E. G., and Veeraragavan, A., Highway Materials laboratory Testing, Nem Chand & Brothers.
2. Relevant IRC and AASHTO Codes.