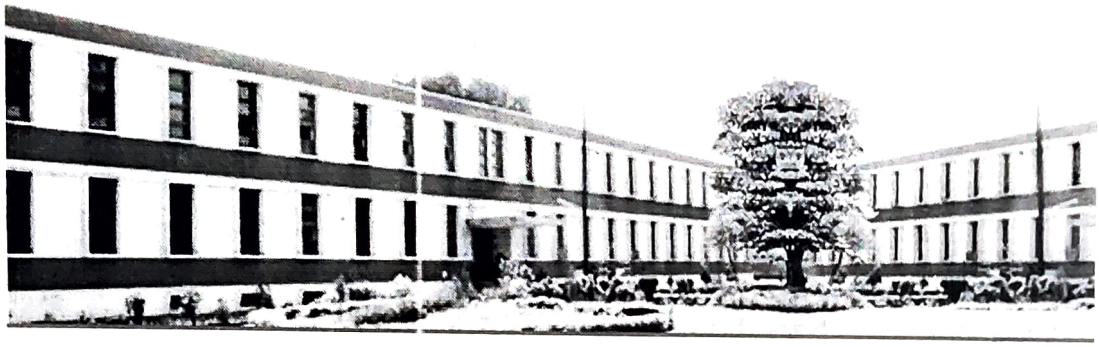
Ramgarhia Polytechnic College, Phagwara



Civil Engineering Department

Head of Department:	Er. Gurcharan Singh
Name of the Faculty:	Er. Sukhdeep Singh
Discipline:	Civil Engineering Department
Semester:	5th
Subject:	Railways Bridges & Tunnels
Lesson Plan Duration:	16 Weeks

RATIONALE

The subject will cater to the needs of those technicians who would like to find employment in the construction of railway tracks, bridges and tunnels. The subject aims at providing broad based knowledge regarding various components and construction of railway track, bridges and tunnels

Learning Outcomes

After undergoing the subject, students will be able to:

- CO1Describe different component parts of permanent way such as rails, sleepers and ballast
- CO2 Distinguish different types of rail gauges used in India
- CO3 Use of different types of rail fastenings and fixtures
- CO4. Classify bridges and select suitable type of bridge for a particular purpose
- CO5. Describe essential components of a ROB and RUB
- CO6. Supervise construction of a tunnel
- CO7. Carry out ventilation, drainage and lightening of tunnels

PO ⟹ / CO ⇩	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	✓						
CO2		✓					✓
CO3		✓			✓		✓
CO4		✓			✓		✓
CO5	✓						✓
CO6		✓	✓				✓
CO7	✓	✓					✓

Syllabus

Units	Details	Hours
PART – I:	RAILWAYS	35 hrs
	1. Introduction to Indian Railways 2. Railway surveys: Factors influencing the railways route, brief description of various types of railway survey 3. Classification of permanent way describing its component parts 4. Rail Gauge: Definition, types, practice in India 5. Rails – types of rails 6. Rail Fastenings: Rail joints, types of rail joints, fastenings for rails, fish plates, bearing plates 7. Sleepers: Functions of sleepers, types of sleepers, requirements of an ideal material for sleepers. 155 8. Ballast: Function of ballast, requirements of an ideal material for ballast 9. Crossings and signalling: Brief description regarding different types of crossings/ signalling 10. Maintenance of track: Necessity, maintenance of track, inspection of soil, track and fixtures; maintenance and boxing of ballast maintenance gauges, tools 11. Earth work and drainage: Features of rail road, bed level, width of formation, side slopes, drains, methods of construction, requirement of drainage system 12. Station and yards: purpose and types of stations and yards	

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PART – II:	BRIDGES 13. Introduction Bridge – its function and component parts, difference between a bridge and a culvert 14. Classification of Bridges Their structural elements and suitability: 14.1 According to life-permanent and temporary 14.2 According to deck level – Deck, through and semi-through 14.3 According to material –timber, masonry, steel, RCC, pre-stressed 14.4 According to structural form; - Grade Seperators-Railway Road Over Bridges (ROB), Road Under Bridge (RUB)	35 hrs

	- Beam type –RCC, T-Beam, steel girder bridges, plate girder and box girder, balanced cantilever, Trussed bridges. - Arch type – open spandrel and filled spandrel barrel and rib type - Suspension type – unstiffened and stiffened and table (its description with sketches) - According to the position of highest flood level submersible and non submersible 14.5 IRC classification 14.6 Concept of Railway ROB and RUB – Precast components of ROB, drainage problems and solutions of RUB 156 15. Bridge Foundations: Introduction to open foundation, pile foundation, well foundation 16. Piers, Abutments and Wingwalls 16.1 Piers-definition, parts; types –solid (masonry and RCC), open 16.2 Abutments and wing walls – definition, types of abutments (straight and tee), abutment with wing walls (straight, splayed, return and curved) 17. Bridge bearings Purpose of bearings; types of bearings – fixed plate, rocker and roller, Elastomaric bearings. 18. Maintenance of Bridges 18.1 Inspection of bridges 18.2 Routine maintenance	

	PART - III: TUNNELS	10 hrs
	19. Definition and necessity of tunnels 20. Typical section of tunnels for a national highway and single and double broad gauge railway track 21. Ventilation –necessity and methods of ventilation, by blowing, exhaust and combination of blowing and exhaust 22. Drainage method of draining water in tunnels 23. Lighting of tunnels	

Reference Books:

- Vaswani, NK, "Railway Engineering", Publishing House, Roorkee
- Rangwala, SC, "Railway Engineering", Anand, Charotar Book Stall
- Deshpande, R, "A Text Book of Railway Engineering", Poonam United Book
- Corporation
- Algia, JS "Bridge Engineering", Anand, Charotar Book Stall
- Victor Johnson, "Essentials of Bridge Engineering" Oxford and IBH, Delhi
- Rangwala S.C., "Bridge Engineering", Anand, Charotar Book Stall
- IRC Bridge Codes
- MORTH drawings for various types of bridges
- MORTH pocket books for bridge Engineers, 2000 (First Revision)
- Subhash C Saxena, "Tunnel Engineering", Dhanpat Rai and Sons, Delhi

Delivery/Instructional Methodologies

Sr.No.	Description
1.	Chalk and Talk
2.	PowerPoint Presentation

Assessment Methodologies

Sr. No.	Description	Type
1.	Student Assignment	Direct
2.	Test	Direct
3.	Board Examination	Direct
4.	Student Feedback	Direct

Gaps in the syllabus - to meet industry/profession requirements

S.NO.	DESCRIPTION	PROPOSED ACTIONS	PO MAPPING
	N/A	N/A	N/A

Topics beyond syllabus/advanced topics

Units	Details	Hours
N/A	N/A	N/A

Web Source References

Sr. No.	URL
1.	https://nptel.ac.in/

Lesson Plan

Week	Theory		Practical	
	Lecture Day		Practical Day	
1st	1st	Introduction to Indian Railways	1.	N/A
	2nd	Railway surveys:		

	3rd	Factors influencing the railways route		
	4th	brief description of various types of railway survey		
	5th	Classification of permanent way		
2nd	6th	describing its component parts	2.	N/A
	7th	Rail Gauge:		
	8th	Definition, types, practice in India		
	9th	Rails – types of rails		
	10th	Rail Fastenings:		
3rd	11th	Rail joints, types of rail joints,	3.	N/A
	12th	fastenings for rails,		
	13th	fish plates, bearing plates		
	14th	Sleepers: Functions of sleeper		
	15th	types of sleepers,		
4th	16th	requirements of an ideal material for sleepers.	4.	N/A
	17th	Ballast: Function of ballast		
	18th	requirements of an ideal material for ballast		
	19th	Crossings and signalling:		
	20th	Brief description regarding different		

		types of crossings/ signalling		
5th	21st	Maintenance of track: Necessity, maintenance of track	5.	N/A
	22nd	inspection of soil, track and fixtures;		
	23rd	maintenance and boxing of ballast maintenance gauges, tools		
	24th	Earth work and drainage		
	25th	Features of rail road, bed level, width of formation		
6th	26th	side slopes, drains,	6.	N/A
	27th	methods of construction, requirement of drainage system		
	28th	Station and yards:		
	29th	purpose and types of stations and yards		
	30th	IntroductionBridge – its function and component parts,		
7th	31st	difference between a bridge and a culvert	7.	N/A
	32nd	Classification of Bridges Their structural elements and suitability:		N/A
	33rd	According to life permanent and		

		temporary		
	34th	According to deck level		
	35th	Deck, through and semi-through		
8th	36th	According to material –timber, masonry,	8.	N/A
	37th	steel, RCC, pre-stressed		
	38th	According to structural form; - Grade Seperators-Railway Road Over Bridges (ROB), Road Under Bridge (RUB)		
	39th	Beam type –RCC, T-Beam, steel girder bridges, plate girder		
	40th	box girder, balanced cantilever, Trussed bridges		
9th	41st	Arch type – open spandrel and filled spandrel barrel and rib type	9.	N/A
	42nd	Suspension type – unstiffened and stiffened and table		
	43rd	According to the position of highest flood level submersible and non submersible		
	44th	IRC classification		
	45th	Concept of Railway ROB and RUB		

10th	46th	Precast components of ROB, drainage problems and solutions of RUB	10.	N/A
	47th	Bridge Foundations: Introduction to open foundation		
	48th	pile foundation, well foundation		
	49th	Piers, Abutments and Wingwalls		
	50th	Piers-definition, parts; types –solid (masonry and RCC), open		
11th	51st	Abutments and wing walls – definition, types of abutments	11	N/A
	52nd	Abutment with wing walls (straight, splayed, return and curved)		
	53rd	Bridge bearings Purpose of bearings; types of bearings		
	54th	fixed plate, rocker and roller, Elastomaric bearings.		
	55th	Maintenance of Bridges		
12th	56th	Inspection of bridges	12.	N/A
	57th	Routine maintenance		
	58th	Definition and necessity of tunnels		

	59th	Typical section of tunnels for a national highway		
	60th	single and double broad gauge railway track		
13th	61st	Ventilation –necessity	13.	N/A
	62nd	methods of ventilationby blowing, exhaust		
	63rd	methods of ventilation by blowing, exhaust		
	64th	combination of blowing and exhaust		
	65th	Drainage method of draining water in tunnels		
14th	66th	Lighting of tunnels	14.	N/A
	67th	Revision Bridge bearings Purpose of bearings; types of bearings		
	68th	Revision Bridge bearings Purpose of bearings; types of bearings		
	69th	Revision pile foundation, well foundation		
	70th	Revision Features of rail road, bed level, width of formation		

15th	71st	Revision Abutment with wing walls (straight, splayed, return and curved)	15.	N/A
	72nd	Revision According to structural form; - Grade Separators-		
	73rd	Revision Precast components of ROB, drainage problems and solutions of RUB		
	74th	Revision Precast components of ROB, drainage problems and solutions of RUB		
	75th	Revision Ventilation – necessity		
16th	76th	Revision Abutment with wing walls (straight, splayed, return and curved)	16.	N/A
	77th	Revision According to structural form; - Grade Separators-		
	78th	Revision Precast components of ROB, drainage problems and solutions of RUB		

NBA has defined the following seven POs for an Engineering diploma graduate:

i) **Basic and Discipline specific knowledge**: Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the engineering problems.

ii) **Problem analysis:** Identify and analyze well-defined engineering problems using codified standard methods.

iii) **Design/ development of solutions**: Design solutions for well-defined technical problems and assist with the design of systems components or processes to meet specified needs.

iv) **Engineering Tools, Experimentation and Testing**: Apply modern engineering tools and appropriate technique to conduct standard tests and measurements.

v) **Engineering practices for society, sustainability and environment**: Apply appropriate technology in context of society, sustainability, environment and ethical practices.

vi) **Project Management**: Use engineering management principles individually, as a team member or a leader to manage projects and effectively communicate about well-defined engineering activities.

vii) **Life-long learning**: Ability to analyze individual needs and engage in updating in the context of technological changes.

Program Specific Outcomes (PSOs)

PSOs are a statement that describes what students are expected to know and be able to do in a specialized area of discipline upon graduation from a program. Program may specify 2-4 program specific outcomes, if required.

These are the statements, which are specific to the particular 11 program. They are beyond POs. Program Curriculum and other activities during the program must help in the achievement of PSOs along with POs.