

**Course Title: Railways, Harbour, Tunneling and Airports**

Professional Elective-1

**[As per Choice Based Credit System (CBCS) scheme]****SEMESTER:V**

Subject Code	15CV552	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03
<b>CREDITS – 03</b>		<b>Total Marks-100</b>	
<b>Course Objectives:</b> This course will enable students to			
1. Understand the history and development, role of railways, railway planning and development based on essential criteria's.			
2. Learn different types of structural components, engineering properties of the materials, to calculate the material quantities required for construction			
3. Understand various aspects of geometric elements, points and crossings, significance of maintenance of tracks.			
4. Design and plan airport layout, design facilities required for runway, taxiway and impart knowledge about visual aids			
5. Apply design features of tunnels, harbours, dock and necessary navigational aids; also expose them to various methods of tunneling and tunnel accessories.			
<b>Modules</b>		<b>Teaching Hours</b>	<b>Revised Bloom's Taxonomy (RBT) Level</b>
<b>Module -1</b>			
<b>Railway Planning:</b> Significance of Road, Rail, Air and Water transports – Coordination of all modes to achieve sustainability – Elements of permanent way – Rails, Sleepers, Ballast, rail fixtures and fastenings, – Track Stress, coning of wheels, creep in rails, defects in rails – Route alignment surveys, conventional and modern methods- – Soil suitability analysis – Geometric design of railways, gradient, super elevation, widening of gauge on curves- Points and Crossings.		8 hours	L1,L2,L3
<b>Module -2</b>			
<b>Railway Construction and Maintenance:</b> Earthwork – Stabilization of track on poor soil, Calculation of Materials required for track laying – Construction and maintenance of tracks – Modern methods of construction & maintenance – Railway stations and yards and passenger amenities- Urban rail – Infrastructure for Metro, Mono and underground railways.		8 Hours	L2, L3
<b>Module -3</b>			

<p><b>Harbour and Tunnel Engineering:</b> Definition of Basic Terms: Planning and Design of Harbours: Requirements, Classification, Location and Design Principles – Harbour Layout and Terminal Facilities, Coastal Structures, Inland Water Transport – Wave action on Coastal Structures and Coastal Protection Works.</p> <p>Tunneling: Introduction, size and shape of the tunnel, tunneling methods in soils, tunnel lining, tunnel drainage and ventilation.</p>	8 Hours	L1,L2,L3
<b>Module -4</b>		
<p><b>Airport Planning:</b> Air transport characteristics, airport classification, air port planning: objectives, components, layout characteristics, socio-economic characteristics of the catchment area, criteria for airport site selection and ICAO stipulations, typical airport layouts, Parking and circulation area.</p>	8 Hours	L1,L2,L3
<b>Module -5</b>		
<p><b>Airport Design :</b> Runway Design: Orientation, Wind Rose Diagram, Runway length, Problems on basic and Actual Length, Geometric design of runways, Configuration and Pavement Design Principles, Elements of Taxiway Design, Airport Zones, Passenger Facilities and Services, Runway and Taxiway Markings and lighting.</p>	8 Hours	L1,L2,L3
<p><b>Course Outcomes:</b> After studying this course, students will be able to:</p> <ol style="list-style-type: none"> <li>1. Acquires capability of choosing alignment and also design geometric aspects of railway system, runway, taxiway.</li> <li>2. Suggest and estimate the material quantity required for laying a railway track and also will be able to determine the hauling capacity of a locomotive.</li> <li>3. Develop layout plan of airport, harbor, dock and will be able relate the gained knowledge to identify required type of visual and/or navigational aids for the same.</li> <li>4. Apply the knowledge gained to conduct surveying, understand the tunneling activities.</li> </ol>		
<p><b>Program Objectives:</b></p> <ul style="list-style-type: none"> <li>• Engineering knowledge</li> <li>• Problem analysis</li> <li>• Interpretation of data</li> </ul>		
<p><b>Question Paper Pattern:</b></p> <ul style="list-style-type: none"> <li>• The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks</li> <li>• There will be two full questions (with a maximum of three subdivisions, if necessary) from each module.</li> <li>• Each full question shall cover the topics as a module</li> <li>• The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.</li> </ul>		
<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Saxena Subhash C and Satyapal Arora, “A Course in Railway Engineering”, Dhanpat Rai and Sons, Delhi,</li> <li>2. Satish Chandra and Agarwal M.M, “Railway Engineering”, 2nd Edition, Oxford University Press, New Delhi,</li> <li>3. Khanna S K, Arora M G and Jain S S, “Airport Planning and Design”, Nemchand and Brothers, Roorkee,</li> <li>4. C Venkatramaiah, “ Transportation Engineering”, Volume II: Railways, Airports, Docks and Harbours, Bridges and</li> </ol>		