



*Your Dreams Our Goal*  
**POORNIMA**  
**UNIVERSITY**

Member of Association of Indian Universities & Approved by UGC (Govt. of India) under 2(f) & 12(B)



# **FACULTY OF ENGINEERING AND TECHNOLOGY**

**PROGRAM:**

**M.TECH TRANSPORTATION ENGINEERING**

**SCHEME & SYLLABUS**

# BOOKLET

BATCH 2025-2027

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**Disclaimer:** The scheme, syllabus and other materials published in this booklet may be changed or modified as per the requirement after approval of competent authority. The decision taken by the management of Poornima University will be final and abiding to all.

### Student Details

Name of Student:

Name of Program:

Semester:

Year:

Batch:

Faculty of:



# *Your Dreams Our Goal* **POORNIMA** **UNIVERSITY**

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## **Vision**

Our vision is to create knowledge based society with scientific temper, team spirit and dignity of labour to face global competitive challenges.

## **Mission**

Our mission is to evolve and develop skill based systems for effective delivery of knowledge so as to equip young professionals with dedication and commitment to excellence in all spheres of life.

## **Quality Policy**

To provide quality education through faculty development, updating of facilities and continual improvement for meeting norms laid down by the government, keeping the stakeholders satisfied. Poornima University has forged industrial alliances with Top MNC's worldwide which assures high educational standards, up to- date and forward-thinking curricula, and professional relevance. At Poornima University you will have a distinct advantage through exposure to the corporate standard environment through industry sponsored infrastructure and expert faculty. The University involves global industry leaders in many ways.

# Knowledge Wheel

At Poornima, the academic atmosphere is a rare blend of modern technical as well as soft skills and traditional systems of learning processes.



## **About Program and Program Outcomes (PO):**

**Title of the Program: Masters of Technology**

**Nature of the Program: M.Tech is a full time two-year program.**

### **Program Outcomes (POs):**

Graduates will be able to:

**PO1.** Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

**PO2.** Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

**PO3.** Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

**PO4.** Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

**PO5.** Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

**PO6.** The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

**PO7.** Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

**PO8.** Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

**PO9.** Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

**PO10.** Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

**PO11.** Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

**PO12.** Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

**Program Specific Outcomes (PSOs):**

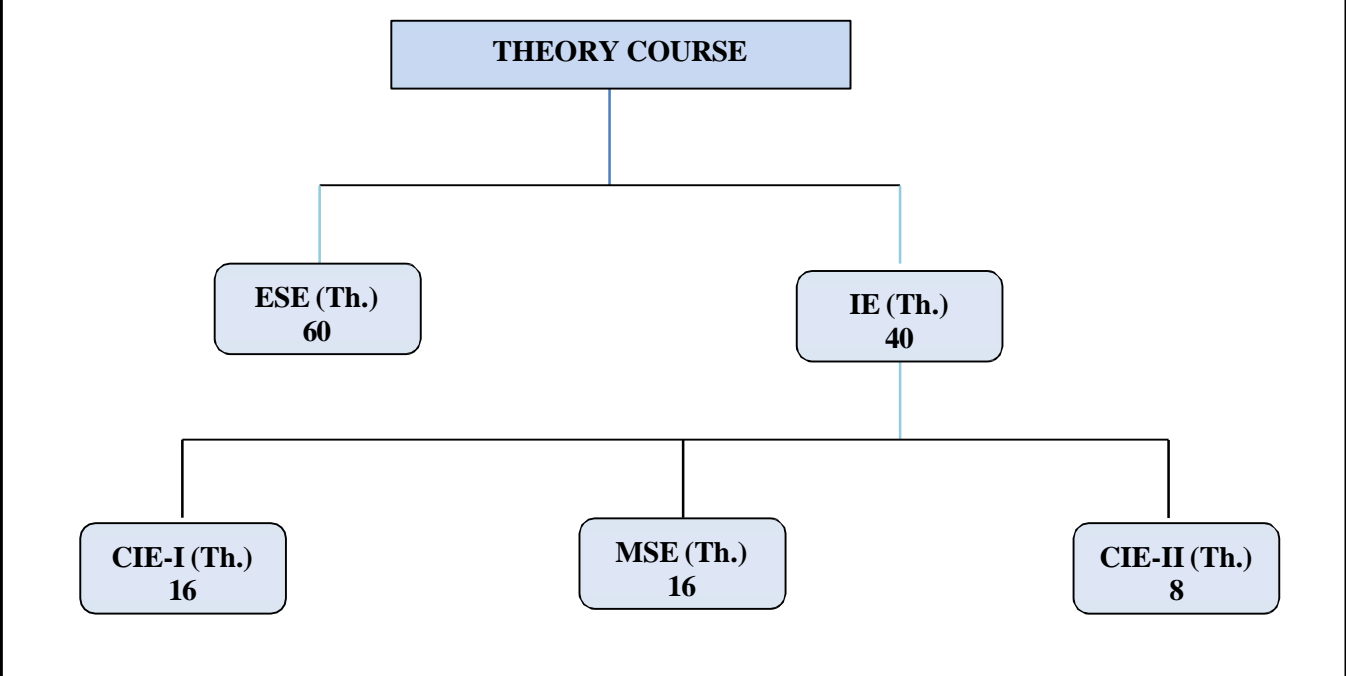
**PSO1:** Capability to manage large infrastructure projects ensuring safe and cost-effective execution of projects having knowledge of fast track construction and project management.

**PSO2:** Ability to use building software packages to calculate safe loads and stresses for designing structural members to ensure safety and serviceability.

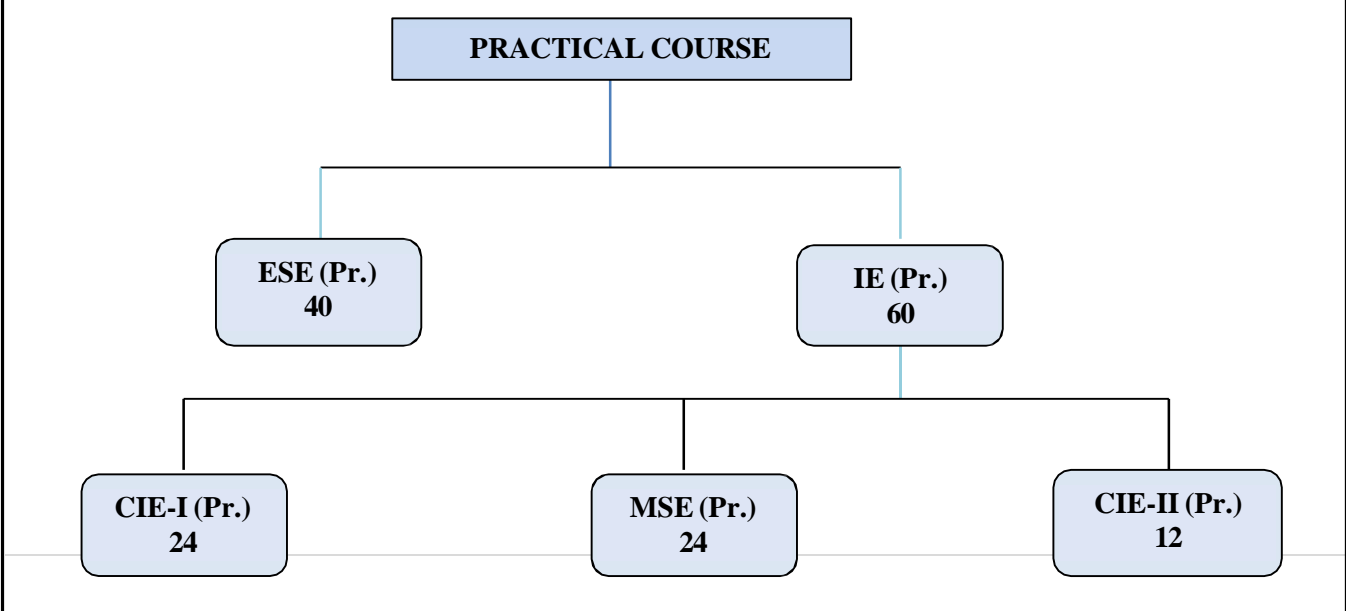
**PSO3:** Ability to provide innovative solutions for traffic safety and efficiency through intelligent transportation systems, and mitigate the environmental impact of construction by adopting green building concepts.

**Examination System :**

**Marks Distribution of Theory Course:**



**A. Marks Distribution of Practical Course :**



**Th.:** Theory, **Pr.:** Practical, **ESE:** End Semester Examination, **MSE:** Mid Semester Examination, **CIE:** Continuous Internal Evaluation.

**CO Wise Marks Distribution:**

<b>Exam Entity</b>	<b>Theory Subject</b>		<b>Practical/ Studio Subject</b>	
	<b>Maximum Marks</b>	<b>CO to be Covered</b>	<b>CO to be Covered</b>	<b>Maximum Marks</b>
<b>CIE-I</b>	16 ( 8 + 8)	1 & 2	1 & 2	24 (12 + 12)
<b>MSE</b>	16 ( 8 + 8)	3 & 4	3 & 4	24 (12 + 12)
<b>CIE-II (Activity/ Assignment )</b>	8 (8)	5	5	12 (12)
<b>ESE</b>	60	-	-	40
<b>TOTAL</b>	100	-	-	100

**Minimum Passing Percentage in All Exams:**

<b>S. No.</b>	<b>Program Name</b>	<b>Minimum Passing Percentage in</b>		
		<b>IE Component</b>	<b>ESE Component</b>	<b>Total Component</b>
1	Course Work for PhD Registration	-	-	50%
2	B. Arch., FIRE Dept. ( BBA, B. Com., MBA)	-	45%	50%
3	MBA, MCA, M.Des., M.Tech., M.Plan, MHA, MPH	-	40%	40%
4	B. Tech., B. Des., BVA, BCA, B.Sc., BBA, B.Com., B.A. & any other program	-	35%	35%

### SGPA Calculation

$$SGPA = \frac{C_1G_1 + C_2G_2 + \dots + C_nG_n}{C_1 + C_2 + \dots + C_n}$$

$$SGPA = \frac{\sum_i C_i \times G_i}{\sum_i C_i}$$

where (as per teaching scheme & syllabus):

$C_i$  is the number of credits of subject  $i$ ,

$G_i$  is the Grade Point for the subject  $I$  and  $i = 1$  to  $n$ ,

$n$  = number of subjects in a course in the semester

### CGPA Calculation

$$CGPA = \frac{C_1G_1 + C_2G_2 + \dots + C_nG_n}{C_1 + C_2 + \dots + C_n}$$

$$CGPA = \frac{\sum_i C_i \times G_i}{\sum_i C_i}$$

where (as per teaching scheme & syllabus):

$C_i$  is the number of credits of subject  $i$ ,

$G_i$  is the Grade Point for the subject  $I$  and  $i = 1$  to  $n$ ,

$n$  = number of subjects in a course of all the semesters up to which CGPA is computed

## Grading Table:

**Table-A**

Applicable for B.Arch., FIRE Courses  
(BBA, B.Com, MBA), & Ph.D. Course Work

**Table-B**

Applicable for All Courses except Table-A

Academic Performance	Grade	Grade Point	Marks Range (in %)
Outstanding	O	10	$90 \leq x \leq 100$
Excellent	A+	9	$80 \leq x < 90$
Very Good	A	8	$70 \leq x < 80$
Good	B+	7	$60 \leq x < 70$
Above Average	B	6	$50 \leq x < 60$
Fail	F	0	$x < 50$
Absent	Ab	0	Absent

Academic Performance	Grade	Grade Point	Marks Range (in %)
Outstanding	O	10	$90 \leq x \leq 100$
Excellent	A+	9	$80 \leq x < 90$
Very Good	A	8	$70 \leq x < 80$
Good	B+	7	$60 \leq x < 70$
Above Average	B	6	$50 \leq x < 60$
Average	C	5	$40 \leq x < 50$
Pass*	P	4	$35 \leq x < 40$
Fail	F	0	$x < 35$
Absent	Ab	0	Absent

\* Not applicable for master programs

### CGPA to percentage conversion rule:

$$\text{Equivalent \% of Marks in the Program} = \text{CGPA} * 10$$

### Award of Class

CGPA	Percentage	Equivalent Division
$7.50 \leq \text{CGPA}$	75% or more	First Division with Distinction
$6.00 \leq \text{CGPA} < 7.50$	$60\% \leq x < 75\%$	First Division
$5.00 \leq \text{CGPA} < 6.00$	$50\% \leq x < 60\%$	Second Division
$4.00 \leq \text{CGPA} < 5.00$	$40\% \leq x < 50\%$	Pass Class

# **Guidelines for Massive Open Online Courses (MOOCs)**

## **(Session 2025-27)**

Poornima University, in its never ending endeavor to equip students with best-of-class learning and knowledge, has undertaken to include MOOC courses as part of its credit scheme from session 2023-24 onwards. The objective behind this is to enable students to study courses designed by the best teachers in the country and to scale their knowledge base with the rest of learners from the nation. The MOOCs which are included under this scheme is can be chosen from SWAYAM-NPTEL.

### **1. Introduction of MOOCs: SWAYAM-NPTEL**

#### **About SWAYAM-NPTEL**

NPTEL (National Programme on Technology Enhanced Learning), is a joint venture of the IITs and IISc, funded by the Ministry of Education (MoE) Government of India, and was launched in 2003. Initially started as a project to take quality education to all corners of the country, NPTEL now offers close to 600+ courses for certification every semester in about 22 disciplines.

#### **Some highlights:**

- Largest online repository in the world of courses in engineering, basic sciences and selected humanities and management subjects
- YouTube channel for NPTEL – most subscribed educational channel, 1.3 billion views and 40+ lakhs subscribers
- More than 56000 hours of video content, transcribed and subtitled
- Most accessed library of peer-reviewed educational content in the world
- Translation of more than 12000 hrs of English transcripts in regional Indian languages

#### **NPTEL Online Certification:**

The objective of enabling students obtain certificates for courses is to make students employable in the industry or pursue a suitable higher education programme. Through an online portal, 4, 8, or 12-week online courses, typically on topics relevant to students in all years of higher education along with basic core courses in sciences and humanities with exposure to relevant tools and technologies, are being offered. Enrolment to and learning from these courses is free. Following these online courses, an in-person, proctored certification exam is conducted and a certificate is provided through the participating institutions and industry, as applicable.

Some statistics regarding the open online courses since March 2014 till Dec 2021

Completed courses: 3496;

Enrollments across courses: 1.58 CRORE +

Number of exam registrations: 15.1 LAKH +

All the statistics pertaining to completed courses are available at <https://beta.nptel.ac.in/courses>.

All courses are completely free to enroll and learn from. The certification exam is optional and comes at a fee of Rs 1000/course exam.

## **2. MOOCs at Poornima University:**

MOOCs envelops best in class teaching - learning processes along with meeting the requirements of various courses in terms of quality of teaching and evaluation system. To promote the MOOCs among students of Poornima University, it is decided to consider the credits earned through MOOCs.

### **(a) MOOCs as Credit Courses**

**(For this document, only those MOOCs will be considered which are available only on NPTEL platforms)**

- Credit and Non-credit SWAYAM-NPTEL MOOCs can be opted by anyone, anytime, anywhere and in any language. However, prior-permission of the University Authorities is mandatory if the credits are to be transferred to regular degree.
- As Open Elective (for batches entered till 2022) / Multidisciplinary Courses (for batches admitted from 2023-24 onwards): Open Elective (for batches entered till 2022) courses were available at University level in offline mode till 2022-23 for which relevant booklets were published. From session 2023-24, Multidisciplinary Courses are introduced in lieu of open elective courses as per NEP 2020. These courses carry 02 credits. These category/type of courses (similar/different) are available as MOOC courses on SWAYAM-NPTEL platform which are being introduced from session 2023-24 onwards for all the students. The respective Deans / HODs shall provide all the information to all the students pertaining to MOOCs as per details given below:
  1. Deans / HODs shall prepare a list of up to 10 appropriate MOOC courses (From NPTEL Only) of Minimum 02/03 credits each, well in advance (at-least 15 days prior to commencement of semester) and take approval from the Office of Dean, Academics / Pro-President, PU.
  2. After approval, the respective Deans / HODs shall circulate a notice to all their respective students so that they can select any one course from the list, the credits (only 02) of which will be counted against Open Elective/ Multidisciplinary courses pertaining to that particular semester.
  3. The tutor of the class shall monitor the progress (assignments, feedback, any problem etc.) on weekly basis and report to Head/Dean and provide the academic support to students as per requirement.

### **(b) Important points related to MOOCs at Poornima University**

- Only one MOOC shall be allowed in a particular semester for the purpose of credit transfer in the beginning.
- No attendance will be taken for MOOC courses.
- The method of assessments of MOOC such as assignments and examination are completely associated with that particular MOOC and no internal exam (IE component) will be conducted by the department as well as by the Examination Cell.
- The respective Dean / HOD must submit the detail of course i.e., code, name and credit of MOOC opted against that particular course in particular semester attached with highlighting in the related examination scheme of syllabus of that semester signed by BOS Convener / HoD and Dean of Faculty to the office of Pro-President before commencement of the classes.
- The center of examination for MOOCs will be finalized by SWAYAM-NPTEL. All the responsibility related to registration for MOOCs, timely submission of assignments, examinations etc. will be borne by the students only.
- NPTEL will award a certificate to all the students passing the examination.
- The list of registered students in MOOC along with name of course will be submitted to the Examination Cell by the Deans / HoDs before commencement of the classes.

- An ESE Exam of each said MOOC course will also be conducted by the University as per University norms.
- The award of marks/grading will be computed as given below:

Award of marks/grading	Remarks
1. 20% weightage taken from MOOC Certificate +80% weightage taken from ESE Exam of Poornima University <b>OR</b> 2. 100% of weightage taken from MOOC Certificate Note: The Higher Marks/Grades of the above two will be considered	The Certificate of MOOC to be Submitted as per date notified by COE, Poornima University

- Any student who would not be able to clear/pass the said course, will be required to appear as a back exam candidate of the University as per PU norms. Students who have not passed the MOOC exam are required to register and participate in the next semester for either the same subject or a similar subject (Ensuring at least 60% of the syllabus matches with the back subject and also approved by respective Dean) offered through NPTEL.
- The scorecard and related certificate of MOOC along with a consolidated list of students with marks of assignment and final exam will be submitted to the examination cell by the concerned Dean / HOD for further process. It is also recommended that alteration/changes/scaling in marks obtained by the students in any MOOC will not be considered.
- The exam registration fee of MOOC up to Max. INR 1000/- will be reimbursed to the student only after successful completion of the course in first attempt and submission of the fee receipt, score-card and certificate of the MOOC to the concerned department within stipulated time after declaration of the results.
- There will be no provision of re-evaluation of MOOC.

**NOTE: This is to be noted that the procedure for getting approval from BOS, Faculty Board, Academic Council and BoM is to be followed as per regular process.**

**Attached Items:**

Ability Enhancement Courses	Annexure-1
Value Added Course Booklet	Annexure-2

POORNIMA UNIVERSITY, JAIPUR										
Faculty of Engineering and Technology										
Name of Program:	M.Tech. in Transportation Engineering		Duration: 2 Years			Total Credits: 81				
Teaching Scheme for Batch 2025-27										
Semester-I										
Course Code	Name of Course	Teaching Scheme				Marks Distribution			Credits	
		Lecture (L)	Tutorial (T)	Practical	SH	IE	ESE	Total		
<b>A.</b>		<b>Major (Core Courses)</b>								
<b>A.1</b>	<b>Theory</b>									
MTECCV1101	Transportation Systems	3	-	-	-	40	60	100	3	
MTECCV1102	Pavement Analysis and Design	3	-	-	-	40	60	100	3	
MTECCV1103	Traffic Engineering	3	-	-	-	40	60	100	3	
<b>A.2</b>	<b>Practical</b>									
MTECCV1201	Transportation Engineering Lab-I	-	-	2		60	40	100	1	
<b>B.</b>		<b>Minor Stream Courses/ Department Electives I and II</b>								
<b>B.1</b>	<b>Theory</b>									
MTEECV1101	Geo-spatial Techniques	3	0	-	-	40	60	100	3	
MTEECV1102	Bridge Engineering			-	-	40	60	100		
MTEECV1103	Advanced Highway Materials			-	-	40	60	100		
MTEECV1104	Traffic Flow Theory	3	0	-	-	40	60	100	3	
MTEECV1105	Project Management					40	60	100		
MTEECV1106	Numerical Methods & Applied Statistic			-	-	40	60	100		
<b>B.2</b>	<b>Practical</b>									
	-	-	-	-	-	-	-	-	-	
<b>C</b>		<b>Multidisciplinary Courses</b>								
MULEBX1109	Research Methodology	3	-	-	-	40	60	100	3	
<b>D</b>		<b>Ability Enhancement Courses (AEC)</b>								
MUACHM1201	Communication Skill - I	-	-	2		60	40	100	1	
<b>E</b>		<b>Skill Enhancement Courses (SEC)</b>								
MULCSE1201	Skill Enhancement Technical Course	-	-	4	-	60	40	100	2	
<b>F</b>		<b>Value Added Courses (VAC)</b>								
	-	-	-	-	-	-	-	-	-	
<b>G</b>		<b>Summer Internship / Research Project / Dissertation</b>								
MTECCV1401	Seminar-I	-	-	4	-	60	40	100	2	
<b>Total</b>		18	0	12					<b>24</b>	
<b>Total Teaching Hours</b>		<b>30</b>								

POORNIMA UNIVERSITY, JAIPUR									
Faculty of Engineering and Technology									
Name of Program:	M.Tech. in Transportation Engineering			Duration: 2 Years			Total Credits: 81		
Teaching Scheme for Batch 2025-27									
Semester-II									
Course Code	Name of Course	Teaching Scheme				Marks Distribution			Credits
		Lecture (L)	Tutorial (T)	Practical	S H	IE	ES E	Total	
<b>A.</b>		<b>Major (Core Courses)</b>							
<b>A.1 Theory</b>									
MTECCV2101	Highway Traffic Analysis and Design	3	-	-		40	60	100	3
MTECCV2102	Highway Construction Practice	3	-	-		40	60	100	3
MTECCV2103	Public Transportation	3				40	60	100	3
<b>A.2 Practical</b>									
MTECCV2201	Transportation Engineering Lab-II	-	-	2		60	40	100	1
<b>B.</b>		<b>Minor Stream Courses/ Department Electives I and II</b>							
<b>B.1 Theory</b>									
MTEECV2101	Analysis of Transportation Systems	3	0	-	-	40	60	100	3
MTEECV2102	Transportation Planning			-	-	40	60	100	
MTEECV2103	Environmental Impact Assessment			-	-	40	60	100	
MTEECV2104	Transportation Network Analysis and Optimization	3	0	-	-	40	60	100	3
MTEECV2105	Transportation Project Evaluation and Decision Making			-	-	40	60	100	
MTEECV2106	Intelligent Transportation Systems			-	-	40	60	100	
<b>B.2 Practical</b>									
	-	-	-	-	-	-	-	-	-
<b>C</b>		<b>Multidisciplinary Courses</b>							
	MOOC Course - I	3	-	-	-	-	-	-	3
<b>D</b>		<b>Ability Enhancement Courses (AEC)</b>							
MUACHM2207	Communication Skill - II	-	-	2		60	40	100	1
<b>E</b>		<b>Skill Enhancement Courses (SEC)</b>							
MULCSE2201	Skill Enhancement Technical Course-II	-	-	4		60	40	100	2
MULCCV2202	Review/Research Paper-I	-	-	2		60	40	100	1
<b>F</b>		<b>Value Added Courses (VAC)</b>							
	-	-	-	-	-	-	-	-	-
<b>G</b>		<b>Summer Internship / Research Project / Dissertation</b>							
MTECCV2401	Seminar-II	-	-	2	-	60	40	100	1
<b>Total</b>		18	0	12					<b>24</b>
<b>Total Teaching Hours</b>		<b>30</b>							<b>24</b>

POORNIMA UNIVERSITY, JAIPUR									
Faculty of Engineering and Technology									
Name of Program:	M.Tech. in Transportation Engineering			Duration: 2 Years			Total Credits: 81		
Teaching Scheme for Batch 2025-27									
Semester-III									
Course Code	Name of Course	Teaching Scheme				Marks Distribution			Credits
		Lecture (L)	Tutorial (T)	Practical	SH	IE	ESE	Total	
<b>A.</b>		<b>Major (Core Courses)</b>							
<b>A.1</b>	<b>Theory</b>								
<b>A.2</b>	<b>Practical</b>								
MTECCV3401	Review/Research Paper-II	0	0	2		60	40	100	1
MTECCV3402	Industrial Technical Seminar	0	0	4		60	40	100	2
<b>B.</b>		<b>Minor Stream Courses/ Department Electives/ <u>Open Elective</u></b>							
<b>B.1</b>	<b>Theory</b>								
<b>C</b>		<b>Multidisciplinary Courses</b>							
	MOOC Course - II	3	-	-	-	-	-	-	3
<b>D</b>		<b>Ability Enhancement Courses (AEC)</b>							
<b>E</b>		<b>Skill Enhancement Courses (SEC)</b>							
-	-	-	-	-	-	-	-	-	-
<b>F</b>		<b>Value Added Courses (VAC)</b>							
<b>G</b>		<b>Summer Internship / Research Project / Dissertation</b>							
MTECCV3403	Internship	-	-	12	-	40	60	100	6
MTECCV3404	Dissertation Part - I	-	-	12	-	60	40	100	6
<b>Total</b>		3	0	30					<b>18</b>
<b>Total Teaching Hours</b>		<b>33</b>							

POORNIMA UNIVERSITY, JAIPUR									
Faculty of Engineering and Technology									
Name of Program:	M.Tech. in Transportation Engineering      Duration: 2 Years      Total Credits: 81								
Teaching Scheme for Batch 2025-27									
Semester-IV									
Course Code	Name of Course	Teaching Scheme				Marks Distribution			Credits
		Lecture (L)	Tutorial (T)	Practical	SH	IE	ESE	Total	
<b>A.</b>		<b>Major (Core Courses)</b>							
<b>A.1</b>	<b>Theory</b>								
-	-	-	-	-	-	-	-	-	-
<b>A.2</b>	<b>Practical</b>								
-	-	-	-	-	-	-	-	-	-
<b>B.</b>		<b>Minor Stream Courses/ Department Electives/ <i>Core Elective</i></b>							
<b>B.1</b>	<b>Theory</b>								
-	-	-	-	-	-	-	-	-	-
<b>B.2</b>	<b>Practical</b>								
-	-	-	-	-	-	-	-	-	-
<b>C</b>		<b>Multidisciplinary Courses</b>							
-	-	-	-	-	-	-	-	-	-
<b>D</b>		<b>Ability Enhancement Courses (AEC)</b>							
-	-	-							
<b>E</b>		<b>Skill Enhancement Courses (SEC)</b>							
-	-	-	-	-	-	-	-	-	-
<b>F</b>		<b>Value Added Courses (VAC)</b>							
-	-	-	-	-	-	-	-	-	-
<b>G</b>		<b>Summer Internship / Research Project / Dissertation</b>							
MTECCV4401	Dissertation Part - II	-	-	30	-	250	250	500	15
<b>Total</b>		0	0	30					<b>15</b>
<b>Total Teaching Hours</b>		<b>30</b>							

POORNIMA UNIVERSITY, JAIPUR									
Faculty of Engineering and Technology									
Name of Program:	M.Tech. in Transportation Engineering		Duration: 2 Years			Total Credits: 81			
Teaching Scheme for Batch 2025-27									
Semester-I									
Course Code	Name of Course	Teaching Scheme				Marks Distribution			Credits
		Lecture (L)	Tutorial (T)	Practical	S H	I E	ES E	Total	
<b>A. Major (Core Courses)</b>									
<b>A.1 Theory</b>									
MTECCV1101	Transportation Systems	3	-	-	-	40	60	100	3
MTECCV1102	Pavement Analysis and Design	3	-	-	-	40	60	100	3
MTECCV1103	Traffic Engineering	3	-	-	-	40	60	100	3
<b>A.2 Practical</b>									
MTECCV1201	Transportation Engineering Lab-I	-	-	2		60	40	100	1
<b>B. Minor Stream Courses/ Department Electives I and II</b>									
<b>B.1 Theory</b>									
MTEECV1101	Geo-spatial Techniques	3	0	-	-	40	60	100	3
MTEECV1102	Bridge Engineering			-	-	40	60	100	
MTEECV1103	Advanced Highway Materials			-	-	40	60	100	
MTEECV1104	Traffic Flow Theory	3	0	-	-	40	60	100	3
MTEECV1105	Project Management			-	-	40	60	100	
MTEECV1106	Numerical Methods and Applied Statistics			-	-	40	60	100	
<b>B.2 Practical</b>									
	-	-	-	-	-	-	-	-	-
<b>C. Multidisciplinary Courses</b>									
MULEBX1109	Research Methodology	3	-	-	-	40	60	100	3
<b>D. Ability Enhancement Courses (AEC)</b>									
MUACHM1201	Communication Skill - I	-	-	2		60	40	100	1
<b>E. Skill Enhancement Courses (SEC)</b>									
MULCSE1201	Skill Enhancement Technical Course	-	-	4	-	60	40	100	2
<b>F. Value Added Courses (VAC)</b>									
	-	-	-	-	-	-	-	-	-
<b>G. Summer Internship / Research Project / Dissertation</b>									
MTECCV1401	Seminar-I	-	-	4	-	60	40	100	2
<b>Total</b>		18	0	12					<b>24</b>
<b>Total Teaching Hours</b>		<b>30</b>							

# M. Tech. TRANSPORTATION ENGINEERING

## Syllabus – First Semester

Code: MTECCV1101

Transportation Systems

3 Credits [LTP: 3-0-0]

### COURSE OVERVIEW AND OBJECTIVES

This course deals with the advancement of the transportation system with the application of ITS. The students learn in this course use of telecommunication and other sensors for achieving the objectives of the ITS. The data collection process and various functional areas of the ITS is to be discussed in this course.

### COURSE OUTCOME

After completion of this course, student will be able to:

CO No.	Description
CO1	Analyze ITS, AVL, AVI and GIS.
CO2	Demonstrate Traffic Management Centre (TMC), Vehicle, Road side communication and Vehicle Positioning System.
CO3	Interpret Advanced Traffic Management, Advanced Traveler Information, Commercial Vehicle Operations, Advanced Vehicle Control, Public and Rural Transportation Systems.
CO4	Examine the management of Travel, Traffic, Public Transportation and safety.
CO5	Relate Automated Highway Systems with ITS Programs.

### A. DETAILED SYLLABUS

Unit 1	Introduction to Intelligent Transportation Systems (ITS) – Definition of ITS and Identification of ITS Objectives, Historical Background, Benefits of ITS - ITS Data collection techniques – Detectors, Automatic Vehicle Location (AVL), Automatic Vehicle Identification (AVI), Geographic Information Systems (GIS), video data collection.
Unit 2	Telecommunications in ITS – Importance of telecommunications in the ITS system, Information Management, Traffic Management Centers (TMC). Vehicle – Road side communication – Vehicle Positioning System
Unit 3	ITS functional areas – Advanced Traffic Management Systems (ATMS), Advanced Traveler Information Systems (ATIS), Commercial Vehicle Operations (CVO), Advanced Vehicle Control Systems (AVCS), Advanced Public Transportation Systems (APTS), Advanced Rural Transportation Systems (ARTS).
Unit 4	ITS User Needs and Services – Travel and Traffic management, Public Transportation Management, Electronic Payment, Commercial Vehicle Operations, Emergency Management, Advanced Vehicle safety systems, Information Management
Unit 5	Automated Highway Systems - Vehicles in Platoons – Integration of Automated Highway Systems. ITS Programs in the World – Overview of ITS implementations in developed Countries, ITS in developing countries.

### B. RECOMMENDED STUDY MATERIAL:

S.No	Title	Author
1.	Recommendations for World Road Association (PIARC)	Kan Paul Chen, John Miles, ITS Hand Book 2000

S. No	Important web links
1.	<a href="https://nptel.ac.in/courses/103/105/103105128/">https://nptel.ac.in/courses/103/105/103105128/</a>
2.	<a href="https://nptel.ac.in/courses/105/106/105106058/">https://nptel.ac.in/courses/105/106/105106058/</a>

#### D. COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	-	1	-	1	-	-	-	-	1
CO2	1	1	2	-	1	-	-	-	-	-	-	-
CO3	1	-	3	-	1	-	-	-	-	-	-	1
CO4	2	-	3	-	1	-	-	-	-	-	-	-
CO5	2	1	2	-	1	-	-	-	-	-	-	1

#### E. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	-	2	2	-
CO2	2	-	1	3	1
CO3	1	-	3	1	-
CO4	2	-	3	-	-
CO5	2	-	1	3	1

**Note:** On the basis of mapping of COs with POs, this course is related to Employability / Skill Development

**COURSE OVERVIEW AND OBJECTIVES:**

This course deals with the pavement analysis and design. In this course the students learn the process of characterizing the pavement material, analyzing the design factors of the pavement, designing flexible and rigid pavement and handling road service management.

**A. COURSE OUTCOME**

After completion of this course, student will be able to:

CO No.	Description
CO1	Analyze the pavement and the pavement materials.
CO2	Evaluate pavement design factors for deciding quantity of different components of pavement.
CO3	Design flexible pavement by IRC,AASHTO and Mechanistic-Empirical Methods.
CO4	Design rigid pavement and joints by IRC and AASHTO Methods.
CO5	Interpret post performance of pavement.

**B. DETAILED SYLLABUS**

<b>Unit 1</b>	Types and component parts of pavements, Factors affecting design and performance of pavements. Highway and airfield pavements, Requirements and desirable properties of aggregates, bitumen, emulsion and modified bitumen, Characterization of different pavement materials
<b>Unit 2</b>	Pavement Design Factors Design wheel load, strength characteristics of pavement materials, climatic variations, traffic - load equivalence factors and equivalent wheel loads, aircraft loading, gear configuration and tyre pressure. Drainage-Estimation of flow, surface drainage, sub-surface drainage systems, design of sub-surface drainage structures
<b>Unit 3</b>	Flexible Pavement Design Empirical, semi-empirical and theoretical approaches, design of highway and airport pavements by IRC,AASHTO Methods, Mechanistic-Empirical design, applications of pavement design software
<b>Unit 4</b>	Rigid Pavement Design Types of joints and their functions, joint spacing; design of CC pavement for roads, highways and airports as per IRC, AASHTO, design of joints. Design of continuously reinforced concrete pavements. Reliability; Use of software for rigid pavement design
<b>Unit 5</b>	Pavement Management Distresses in pavements, maintenance of highways, structural and functional condition evaluation of pavements, performance prediction models, ranking and optimization in pavement management.

**C. RECOMMENDED STUDYMATERIAL:**

S. No	Title of the Book	Author
1.	Principles of Pavement Design	Yoder and Witzak, John Wiley and Sons
2.	Pavement Analysis and Design,	Yang, H. Huang, Prentice Hall Inc.
3.	Pavement Engineering –	Rajib B. Mallick and Tahar El-Korchi, CRC
4.	Modern Pavement Management	W.Ronald Hudson, Ralph Haas and Zeniswki, Mc

S. No	Important web links
1.	<a href="https://nptel.ac.in/courses/105/105/105105107/">https://nptel.ac.in/courses/105/105/105105107/</a>

2.	<a href="https://www.youtube.com/watch?v=uJntLOgEHD4">https://www.youtube.com/watch?v=uJntLOgEHD4</a>
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**C. COs AND POs MAPPING**

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	-	-	2	1	-	-	-	-	1
CO2	1	1	2	1	1	-	1	-	-	-	-	-
CO3	1	1	3	1	1	-	-	-	1	-	-	-
CO4	1	1	3	-	-	-	1	-	1	1	1	-
CO5	1	1	3	-	1	1	-	-	-	-	-	1

**D. COs AND PSOs MAPPING**

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	-	-	1
CO2	1	3	-	2	1
CO3	3	1	1	1	-
CO4	3	2	2	-	-
CO5	3	2	-	-	2

**Note:** On the basis of mapping of COs with POs, this course is related to Employability / Skill Development

**COURSE OVERVIEW AND OBJECTIVES:** This course provides fundamental knowledge of traffic engineering, focusing on road user behaviour, traffic flow characteristics, accident analysis, and control measures. It also emphasizes traffic data collection, signal design, regulation, parking, and management strategies as per IRC standards and the Motor Vehicle Act.

**COURSE OUTCOME**

After completion of this course, student will be able to:

CO	Description
CO1	Recall the fundamental traffic and road user characteristics, as well as vehicular limitations prescribed by Indian regulations.
CO2	Explain various traffic studies such as volume, speed, O-D, and delay studies using conventional and photographic methods.
CO3	Apply the principles of accident analysis and traffic flow theory to determine road capacity and level of service based on IRC recommendations.
CO4	Analyze the effectiveness of traffic control devices, signal design, and intersection management including grade separation and rotary design.
CO5	Evaluate traffic regulations and propose appropriate parking and terminal facility design strategies for efficient traffic management.

**A. DETAILED SYLLABUS**

<b>Unit 1</b>	<b>Traffic Characteristics and Road User Aspects</b> Importance of traffic characteristics, Road user characteristics, Vehicular characteristics, Maximum dimensions and weights of vehicles allowed in India, Effects of traffic characteristics on various design elements of the road.
<b>Unit 2</b>	<b>Traffic Studies and Surveys</b> Traffic volume study, Speed study, Origin and destination study, Speed and delay study Use of photographic techniques in traffic surveys.
<b>Unit 3</b>	<b>Traffic Accidents and Roadway Capacity</b> Accident surveys, Causes of road accidents and preventive measures, Capacity and level of service, Fundamental diagram of traffic flow, Relationship between speed, volume, and density, Passenger Car Unit (PCU), Design service volume, Capacity of non-urban roads, IRC recommendations, Brief review of capacity of urban roads.
<b>Unit 4</b>	<b>Traffic Control Devices and Intersection Design</b> Traffic control devices: signs, signals, markings, and islands, Types of signs, Types of signals, Design of signals by IRC method, Intersections at grade and grade separated intersections, Design of a rotary, Types of grade separated intersections
<b>Unit 5</b>	<b>Traffic Regulation, Parking and Terminal Facilities</b> Need and scope of traffic regulations, Regulation of speed, vehicles, and drivers, General traffic regulations, Motor Vehicle Act (overview), Scope of traffic management, Parking surveys, On-street parking, Off-street parking, Design of parking, lighting, and terminal facilities.

## B. RECOMMENDED STUDYMATERIAL:

S. No	Title of the Book	Author
1.	Traffic Engineering and Transportation Planning	L.R. Kadiyali
2.	Principles of Transportation Engineering	Partha Chakroborty & Animesh Das
3.	Transportation Engineering	C.E.G. Justo & Rakesh Kumar
4.	Highway Engineering	S.K. Khanna & C.E.G. Justo
5.	Traffic Engineering	Roger P. Roess, Elena S. Prassas, William R. McShane

S. No	Important web links
1	Indian Roads Congress (IRC) – Official website for IRC codes and publications
2	Ministry of Road Transport and Highways (MoRTH) – Guidelines, notifications, and reports related to national highways and traffic policies
3	Central Road Research Institute (CSIR-CRRI) – Research and innovations in road and traffic engineering
4	Transportation Research Board (TRB), USA – Global research papers, traffic engineering resources
5	National Transportation Planning and Research Centre (NATPAC) – Indian transport research institute with case studies and publications

## C. COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	1
CO2	3	3	1	-	-	-	-	-	-	-	-	2
CO3	3	2	3	2	-	-	-	-	-	-	-	2
CO4	2	2	3	3	2	-	1	-	-	-	-	2
CO5	2	1	3	2	2	2	2	1	-	1	-	3

## D. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	-	-	-
CO2	3	3	1	-	-
CO3	2	3	2	-	-
CO4	2	3	3	1	-
CO5	1	2	3	2	1

**Note:** On the basis of mapping of COs with POs, this course is related to Employability / Skill Development

**A. DETAILED SYLLABUS****List of Experiments**

Design as per syllabus of theory

S. No	Important web links
1.	<a href="https://nptel.ac.in/courses/105/107/105107123/">https://nptel.ac.in/courses/105/107/105107123/</a>

**B. COs AND POs MAPPING**

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	-	-	2	1	-	-	-	-	1
CO2	1	1	2	1	1	-	1	-	-	-	-	-
CO3	1	1	3	1	1	-	-	-	1	-	-	-
CO4	1	1	3	-	-	-	1	-	1	1	1	-
CO5	1	1	3	-	1	1	-	-	-	-	-	1

**C. COs AND PSOs MAPPING**

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	-	-	1
CO2	1	3	-	2	1
CO3	3	1	1	1	-
CO4	3	2	2	-	-
CO5	3	2	-	-	2

**Note:** On the basis of mapping of COs with POs, this course is related to Employability / Skill Development

## Department Elective Course-I

Code: MTEECV1101	Geo-spatial Techniques	3 Credits [LTP: 3-0-0]
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### COURSE OUTCOME

After completion of this course, student will be able to:

CO No.	Description
CO1	Analyze the EMS, EMR, Spectral Signature curves, Data interpretation and Photogrammetry using Radar, LIDAR, and SAR systems.
CO2	Demonstrate satellite system and sensor parameters.
CO3	Draw map using GIS system.
CO4	Design the working process of GIS and Space Geodetic Techniques.
CO5	Apply GIS in Transportation planning, Infrastructure development, Structural, Geotechnical, Earthquake, Environmental and Water resource Engineering.

### A. DETAILED SYLLABUS

<b>Unit 1</b>	Concepts and foundations of remote sensing – energy source EMS – Remote Sensing System – EMR interaction with particulate matter – Spectral Signature curves – Data Acquisition and interpretation – Visual Image Interpretation – Photogrammetry – Radar, LIDAR, SAR systems
<b>Unit 2</b>	Platform/Sensors – Classification – satellite system/sensor parameters – earth resources and meteorological satellites – microwave remote sensing techniques – Data Processing – Digital Image processing – Characteristics of Digital Satellite Image – groundtruthing
<b>Unit 3</b>	History of Development – Maps – Types of Maps, Projections – Components/Architecture of GIS – Data Spatial and Non-Spatial – Data Input Sources – Raster and Vector data structures DBMS –Data Output – Data quality – Sources/ types of errors
<b>Unit 4</b>	Data handling in GIS –processing, analysis and Modeling – Raster and Vector spatial analysis Density analysis– Spatial autocorrelation – network analysis – nearest neighbor analysis – Surface modeling – DTM – Introduction to Geodesy – Space Geodetic Techniques
<b>Unit 5</b>	GPS Application of Remote Sensing, GIS and GPS – Survey, mapping and monitoring – Transportation planning – Infrastructure development – Structural engineering – Geotechnical Engineering – Earthquake Engineering –Environmental studies – Water resources

### B. RECOMMENDED STUDY MATERIAL:

S. No	Title of the Book	Author
1	Concepts and Techniques of Geographical	C.P. Lo and Albert K. W. Yeung, Prentice– Hall India,
2	Remote Sensing and Image Interpretation	Thomas. M. Lillesand and Ralph. W. Kiefer, John Wiley and Sons, 2003
3	Fundamentals of Remote Sensing	Joseph G., University Press, 2005
4	Geographical Information systems	Panigrahi, N., University Press, 2005

S. No	Important web links
1.	<a href="https://nptel.ac.in/courses/105/107/105107155/">https://nptel.ac.in/courses/105/107/105107155/</a>
2.	<a href="https://nptel.ac.in/courses/121/107/121107009/">https://nptel.ac.in/courses/121/107/121107009/</a>

### C. COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	-	-	2	1	-	-	-	-	1
CO2	1	1	2	1	1	-	1	-	-	-	-	-
CO3	1	1	3	1	1	-	-	-	1	-	-	-
CO4	1	1	3	-	-	-	1	-	1	1	1	-
CO5	1	1	3	-	1	1	-	-	-	-	-	1

### D. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	-	-	1
CO2	1	3	-	2	1
CO3	3	1	1	1	-
CO4	3	2	2	-	-
CO5	3	2	-	-	2

**Note:** On the basis of mapping of COs with POs, this course is related to Employability / Skill Development

**COURSE OVERVIEW AND OBJECTIVES**

This course facilitates the students to learn different type of bridge on the basis of shape size and functions. In this course students learn the designing of various components of the bridge systems.

**A. COURSE OUTCOME**

After completion of this course, student will be able to:

CO No.	Description
CO1	Demonstrate bridges on the basis of their importance and site selection.
CO2	Evaluate the width of carriageway, loads and Impact effect.
CO3	Design of culvert, Foot Bridge, Slab Bridge, T-beam bridge, Pre-stressed concrete bridge, Box Culvert and Fly over bridges.
CO4	Analyze the Pier, abutments caps and foundations.
CO5	Interpret the bearings and the joints in the bridge.

**B. DETAILED SYLLABUS**

<b>Unit 1</b>	Components of Bridges – Classification – Importance of Bridges – Investigation for Bridges – Selection of Bridge site – Economical span – Location of piers and abutments – Subsoil exploration – Scour depth– Traffic projection – Choice of bridge type
<b>Unit 2</b>	Specification of road bridges – width of carriageway – loads to be considered – dead load – IRC standard live load – Impact effect
<b>Unit 3</b>	General design considerations – Design of culvert – Foot Bridge - Slab Bridge – T-beam bridge– Pre-stressed concrete bridge – Box Culvert - Fly over bridges
<b>Unit 4</b>	Evaluation of sub structures – Pier and abutments caps – Design of pier – Abutments Type of foundations
<b>Unit 5</b>	Importance of Bearings – Bearings for slab bridges – Bearings for girder bridges– Electrometric bearing– Joints – Expansion joints. Construction and Maintenance of bridges – Lessons from bridge failures

**C. RECOMMENDED STUDYMATERIAL:**

S. No	Title of the Book	Author
1.	Bridge Engineering	Ponnuswamy, Tata McGraw - Hill, New Delhi, 1997
2.	Essentials of Bridge Engineering	Victor, D.J.,Oxford& IBH Publishers Co., New Delhi, 1980
3.	Bridge Superstructure	N. Rajagopalan, Narosa Publishing House, New Delhi, 2006

S. No	Important web links
1.	<a href="https://swayam.gov.in/nd1_noc19_ce23/preview">https://swayam.gov.in/nd1_noc19_ce23/preview</a>
2.	<a href="https://nptel.ac.in/courses/105/105/105105165/">https://nptel.ac.in/courses/105/105/105105165/</a>

#### D. COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2		1	-	-	-	-	-	-	-	-
CO2	2	2	1	2	-	-	-	-	-	-	-	-
CO3	2	3	-	1	-	-	-	-	-	-	-	-
CO4	2	-	3	-	1	-	-	-	-	-	-	-
CO5	2	2	2	1	-	-	-	-	-	-	-	-

#### E.COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	-	2	-	1
CO2	2	3	-	1	-
CO3	1	2	3	1	-
CO4	-	2	2	-	3
CO5	1	1	-	3	2

**Note:** On the basis of mapping of COs with POs, this course is related to Employability

**A. COURSE OUTCOME**

After completion of this course, student will be able to:

CO No.	Description
CO1	Analyze Aggregate Nature and properties for pavement, bituminous, Portland Cement Concrete and light weight.
CO2	Demonstrate conventional and modified binders.
CO3	Design the mix of concrete materials for High Performance Concrete with low shrinkage.
CO4	Interpret Composites, Plastics, Geo-synthetics Plastics and polymerization process.
CO5	Experiment Recycled Waste Products and Reclaimed Materials in civil engineering.

**B. DETAILED SYLLABUS**

<b>Unit 1</b>	Aggregate Nature and properties -aggregate requirements- types and processing-aggregates for pavement base -aggregate for bituminous mixture -aggregate for Portland Cement Concrete -lightweight aggregate- tests on aggregate-specification
<b>Unit 2</b>	Bituminous Materials conventional and modified binders-production-types and grade-physical and chemical properties and uses-types of asphalt pavement construction-principles of bituminous pavement construction-tests on bituminous materials. Bituminous Mix design-modified mixtures-temperature susceptibility and performance.
<b>Unit 3</b>	Cement /concrete-based materials Cement-properties-PCC mix design and properties- modified PCC- Mix Design-Behavior-Performance-Tests on Cement and Concrete mixes. High Performance Concrete-low shrinkage-increased strength.
<b>Unit 4</b>	Composites, Plastics and Geo-synthetics Plastics and polymerization process-properties-durability and chemical composition-Reinforced Polymer Composites-Geo-Synthetics-Dry Powdered Polymers-Enzymes
<b>Unit 5</b>	Reclaimed / Recycled Waste Products Reclaimed Materials-waste products in civil engineering applications -effect of waste products on materials, structure and properties-self healing and smart materials- locally available materials.

**C. RECOMMENDED STUDY MATERIAL:**

S. No	Title of the Book	Author
1.	Alternative Materials in Road Construction	P. T. Sherwood, Thomas Telford Publication, London, 1997.
2.	Soil Mechanics for Road Engineers	RRL, DSIR, HMSO, London , 1995
3.	Designing with Geosynthetics	Koerner, R. M., Prentice Hall, Englewood Cliffs, New Jersey, U.S.A.
4.	Civil Engineering Materials	Shan Somayaji, second edition, Prentice Hall Inc., 2001

S. No	Important web links
1.	<a href="https://nptel.ac.in/courses/105/105/105105107/">https://nptel.ac.in/courses/105/105/105105107/</a>
2.	<a href="https://nptel.ac.in/courses/105/106/105106053/">https://nptel.ac.in/courses/105/106/105106053/</a>
3.	<a href="https://nptel.ac.in/courses/105/102/105102088/">https://nptel.ac.in/courses/105/102/105102088/</a>

**D. COs AND POs MAPPING**

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	2	2	2	-	-	-	-	-	-	-	-	-
CO3	2	-	2	3	-	-	-	-	-	-	-	-
CO4	2	-	2	-	-	2	-	-	-	-	-	-
CO5	2	2	1	-	1	-	-	-	-	-	-	-

**E. COs AND PSOs MAPPING**

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	1	-	-
CO2	3	3	-	-	-
CO3	3	2	1	-	-
CO4	2	-	1	-	-
CO5	2	2	-	3	-

**Note:** On the basis of mapping of COs with POs, this course is related to Employability / Skill Development

**COURSE OVERVIEW AND OBJECTIVES**

This course deals with the analysis of traffic flow and its distribution on the road. The basic understanding of different models in this course makes the students able to understand the present and future characteristics of traffic. This course also gives the conclusive idea about the use of GPS in traffic system advancement.

**COURSE OUTCOME**

After completion of this course, student will be able to:

CO No.	Description
CO1	Compare relationship between traffic stream parameters.
CO2	Analyze the macroscopic models, fluid flow analogies and bottleneck control approach.
CO3	Design Microscopic model and service time distributions.
CO4	Evaluate car following modal in traffic behavior analysis.
CO5	Interpret the GPS in traffic engineering for advancement of intelligent traffic system.

**DETAILED SYLLABUS**

<b>Unit 1</b>	Traffic stream parameters - Fundamental diagram of volume-speed-density surface. Discrete and continuous probability distributions. Merging maneuvers - critical gaps and their distribution.
<b>Unit 2</b>	Macroscopic models - Heat flow and fluid flow analogies - Shock waves and bottleneck control approach.
<b>Unit 3</b>	Microscopic models - Application of queuing theory - regular, random and Erlang arrival and Service time distributions - Queue discipline - Waiting time in single channel queues and extension to multiple channels.
<b>Unit 4</b>	Linear and non-linear car following models - Determination of car following variables – Acceleration noise
<b>Unit 5</b>	Geographical Information System – Global Positioning System – Intelligent Transportation Systems - Area Traffic Control – Automatic Toll Collection – Smart Cards – Collision Detection System

**RECOMMENDED STUDYMATERIAL:**

S.	Title of the Book	Author
1.	Traffic Flow Theory and Control	Drew, D.R., McGraw Hill., 1978.
2.	Traffic Flow Theory - A Monograph	TRB, SR165, 1975.
3.	Principles of Geographical Information Systems	Burrough P.A. and Rachel A. McDonell, OxfordPublication, 2004
4.	Perspective on ITS	Sussman, J. M., Artech House

S. No	Important web links
1.	<a href="https://www.youtube.com/watch?v=3XaTwQIugJ4">https://www.youtube.com/watch?v=3XaTwQIugJ4</a>
2.	<a href="https://nptel.ac.in/courses/105/105/105105107/">https://nptel.ac.in/courses/105/105/105105107/</a>

#### D.CO's AND PO's MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	-	-	-	1	-	-	-	-	1
CO2	2	1	2	-	1	-	-	-	-	-	-	2
CO3	-	3	-	2	-	-	-	-	-	1	-	-
CO4	1	1	-	2	1	-	-	-	-	1	-	-
CO5	-	1	-	2	1	-	-	-	-	1	-	1

#### E.CO's AND PSO's MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	1	1	2	2
CO2	2	1	1	2	1
CO3	3	2	-	1	-
CO4	1	1	3	1	-
CO5	-	-	-	2	3

**Note:** On the basis of mapping of COs with POs, this course is related to Skill Development

**COURSE OUTCOME**

After completion of this course, student will be able to:

CO No.	Description
CO1	Demonstrate Project based on Management, Processes and project life cycle.
CO2	Interpret Organizational Structures in project.
CO3	Examine the payment to Contract-actors, Tendering, Restricted and open tenders.
CO4	Evaluate PERT and critical path method using Project management software's.
CO5	Interpret the project failures, audit, data collection and analysis.

**DETAILED SYLLABUS**

<b>Unit 1</b>	Introduction to Project & project Management: Basic Theory and Concepts, Project Management –Processes, Knowledge Areas & project life cycle. Conclusion of Unit
<b>Unit 2</b>	Introduction to Organizational Structures: different types of organizations, I.e. matrix, function & project organizations, Influence of organization on projects, role & functions of construction project manager, Project management offices, supportive, controlling & directive PMO, Conclusion of Unit
<b>Unit 3</b>	Introduction to vendor evaluation, criteria for rating vendors, steps for vendor evaluation, Analytic Hierarchy Process (AHP) Project Contracts, types of contracts, types of payments to contractors Tendering, Restricted & open tenders, Negotiated tender & Competitive dialogue & Conclusion of Unit
<b>Unit 4</b>	Introduction to PERT & CPM, Determination of critical path Resource leveling & resource allocation techniques Project management software's. Conclusion of Unit
<b>Unit 5</b>	Common project failures and need for project audit phases of project Audit, Determination of success criteria and questionnaire development, data collection and analysis, report development & Project Check-List

**RECOMMENDED STUDY MATERIAL:**

S. No	Title of the Book	Author
1.	Project Management - A systems approach to Planning, Scheduling and Controlling	Herold Kerzner, CBS Publishers and Distributors
2.	Fundamentals of Construction Management and Organizations	K.Waker A Teraih and Jose M.Grevarn
3.	Construction Cost Engineering Handbook - Marcel	Anghel Patterson

S. No	Important web links
1.	<a href="https://nptel.ac.in/courses/110/104/110104073/">https://nptel.ac.in/courses/110/104/110104073/</a>
2.	<a href="https://nptel.ac.in/courses/110/107/110107081/">https://nptel.ac.in/courses/110/107/110107081/</a>

#### D. COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	-	1	-	1	-	-	-	-	1
CO2	1	1	2	-	1	-	-	-	-	-	-	-
CO3	1	-	3	-	1	-	-	-	-	-	-	1
CO4	2	-	3	-	1	-	-	-	-	-	-	-
CO5	2	1	2	-	1	-	-	-	-	-	-	1

#### E. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	-	2	2	-
CO2	2	-	1	3	1
CO3	1	-	3	1	-
CO4	2	-	3	-	-
CO5	2	-	1	3	1

**Note:** On the basis of mapping of COs with POs, this course is related to Employability / Skill Development

**COURSE OUTCOME**

After completion of this course, student will be able to:

CO No.	Description
CO1	Apply the basic concepts of probability, random variables, probability distribution.
CO2	Compute and interpret descriptive statistics using numerical and graphical techniques
CO3	Use statistical methodology and tools in the engineering problem solving process.
CO4	Apply the basic concepts of regression and curve fitting and calculate finite differences of tabulated data.
CO5	Analyze the one-way two-way variance classification

**A. DETAILED SYLLABUS**

Unit	Unit details
<b>Unit 1</b>	Linear system-Gaussian elimination and Gauss-Jordan methods-matrix inversion-Gauss seidel method-Nonlinear equations-Regulafalsi and Newton-Raphson methods interpolation-Newton's and Lagrange's interpolation
<b>Unit 2</b>	Linear Programming – Graphical and Simplex methods – Measures of central tendency, dispersion, skewness and Kurtosis – Probability – conditional probability – Bayes'theorem
<b>Unit 3</b>	Random variable – two dimensional random variables – standard probability distributions – Binomial Poisson and normal distributions - moment generating function, Sampling distributions – confidence interval estimation of population parameters – testing of hypotheses
<b>Unit 4</b>	Large sample tests for mean and proportion – t-test, F-test and Chi-square test – curve fitting- method of least squares
<b>Unit 5</b>	Regression and correlation – rank correlation – multiple and partial correlation – analysis of variance- one way and two way classifications – experimental design – Latin square design – Time series analysis.

**B. RECOMMENDED STUDY MATERIAL:**

S. No	Title of the Book	Author
1.	Engineering Statistics, Prentice-Hall, 1972	Bowker and Liberman
2.	Numerical Methods in Science and Engineering, National Publisher Company.	Venkatraman, M.K.

S. No	Important web links
1.	<a href="https://nptel.ac.in/courses/122/102/122102009/">https://nptel.ac.in/courses/122/102/122102009/</a>
2.	<a href="https://nptel.ac.in/courses/111/107/111107105/">https://nptel.ac.in/courses/111/107/111107105/</a>

**D. COs and Pos Mapping**

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	-	3	-	1	-	-	-	-	1	-
CO2	1	3	-	2	1	-	-	-	-	-	-	-
CO3	1	-	-	3	1	-	-	-	-	-	1	-
CO4	1	1	3	-	-	-	1	-	-	-	1	-
CO5	1	1	3	-	1	1	-	-	-	-	-	1

**E. COs AND PSOs MAPPING**

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	2	3	1	-
CO2	-	2	2	-	3
CO3	1	1	-	3	2

**COURSE OVERVIEW AND OBJECTIVES**

To familiarize students with basic of research and the research process. To enable the students in conducting research work and formulating research synopsis and report. Develop understanding on various kinds of research, objectives of doing research, research process, research designs and sampling

**COURSE OUTCOME**

The student will be able to:

CO1 To be able to distinguish a purpose statement, a research question or hypothesis, and a research objective.

CO2 To be able to define the meaning of a variable, and to be able to identify independent, dependent, and mediating variables

CO3 To be able to distinguish between categorical and continuous measures

CO4 To be able to design a good quantitative purpose statement and good quantitative research questions and hypotheses

CO5 To understand the link between quantitative research questions and data collection and how research questions are operationalized in educational practice.

**A. OUTLINE OF COURSE**

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	General	9
2.	Connections	10
3.	Towers	8
4.	Plastic Analysis	9
5.	Industrial Building	8

**B. DETAILED SYLLABUS**

Unit	Unit Details
1.	<b>Overview of Research Methodology</b> Introduction, Mathematical tools for analysis, Research problems in management, Types of research, Research Process, Data Collection & Presentation: Introduction, Primary data, Secondary data, Data Presentation
2.	<b>Review of Basic Statistical Measures &amp; Basic Multivariate Analysis</b> Introduction, Measures of Central Tendencies, Measures of Variation, Measures of Skewness. Basic Multivariate Analysis: Introduction, Correlation analysis, Forecasting, Linear regression & Timeseries
3.	<b>Design and Analysis of Experiments</b> Introduction, Analysis of Variance, Completely Randomized design, Randomized complete block design, Latin square design, Duncan"s multiple Range Test, Functional design, second factorial experiment, Expected Mean Square.
4.	<b>Algorithmic Research &amp; Simulation</b> Introduction, Algorithmic Research Problems, Types, Types of Solution Procedures, Steps of development, Steps of Algorithmic Research, Design of Experiments, Meta Heuristics for Combinational Problems Simulation: Introduction, Need for simulation, Types, Simulation Languages, case study.
5.	<b>Report Writing and Presentation</b> Introduction, Types of report, Guidelines for review draft, Report format, Typing Instructions, Oral Presentations

**C. RECOMMENDED STUDYMATERIAL:**

S. No	Title of the Book	Author
1.	Research Methodology	R. Panneerselvam, PHI
2.	Research Methodology: Methods and Trends	Dr. C. R. Kothari
3.	Research Methodology: A Step by Step Guide for Beginners	Ranjit Kumar

**Important Web Links**

1. <a href="https://libguides.wits.ac.za/c.php?g=693518&amp;p=4914913">https://libguides.wits.ac.za/c.php?g=693518&amp;p=4914913</a>
2. <a href="https://www.scribbr.com/dissertation/methodology/">https://www.scribbr.com/dissertation/methodology/</a>
3. <a href="https://www.open.edu/openlearn/money-management/understanding-different-research-perspectives/content-section-8">https://www.open.edu/openlearn/money-management/understanding-different-research-perspectives/content-section-8</a>
4. <a href="https://www.researchgate.net/publication/270956555_CHAPTER_3_-_RESEARCH_METHODODOLOGY_Data_collection_method_and_Research_tools">https://www.researchgate.net/publication/270956555_CHAPTER_3_-_RESEARCH_METHODODOLOGY_Data_collection_method_and_Research_tools</a>
5. <a href="https://www.youtube.com/watch?v=ze5bS-DNERk">https://www.youtube.com/watch?v=ze5bS-DNERk</a>

**D. COs AND POs MAPPING**

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	-	-	-	-	-	-	-	-
CO2	-	2	3	-	2	-	-	-	-	-	-	-
CO3	2	1	3	-	1	-	-	-	-	-	-	-
CO4	2	3	-	2	-	-	-	-	-	-	-	-
CO5	1	1	2	3	-	-	-	-	-	-	-	-

**E. COs AND PSOs MAPPING**

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	1	-	1
CO2	2	-	3	2	-
CO3	1	-	3	1	2
CO4	-	2	2	-	3
CO5	2	1	-	3	1

Note: On the basis of mapping of COs with POs, this course is related to Employability / Skill Development.

**COURSE OUTCOME**

After completion of this course, student will be able to:

CO No.	Description
CO1	To present themselves in an effective manner and know about their short-term and long-term goals.
CO2	To works in a team by managing time properly and focus on personal grooming, etiquettes and body language.
CO3	To demonstrate their abilities by improving skills of LSRW (Listening Speaking/Reading/Writing).
CO4	To present different viewpoints or ways of thinking about a situation, expand their abilities to resolve situations and get experience within the given context.
CO5	To enhance their employability skills by working on the presentation of Résumé and giving impactful performance during Group Discussion.

**DETAILED SYLLABUS**

1.	Self-Introduction & knowing your environment
2.	Goal Setting & Planning
3.	Etiquettes (Personal, Social, Professional & Corporate) etiquettes
4.	Personal Grooming and Body language
5.	Time Management & Team Work
6.	Negotiation and conflict management
7.	Oral Communication & Writing Skills: Extempore & Paper Presentations.
8.	Resume Writing
9.	Group Discussion
10.	Interview Skills

S. No	Important web links
1.	<a href="https://nptel.ac.in/courses/109/107/109107121/">https://nptel.ac.in/courses/109/107/109107121/</a>
2.	<a href="https://nptel.ac.in/courses/109/104/109104107/">https://nptel.ac.in/courses/109/104/109104107/</a>

**A. COs AND POs MAPPING**

COs and LOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	1	-	-	-	-	-	-	-	1
CO2	3	1	-	1	-	-	-	-	-	-	-	1
CO3	3	2	-	1	-	-	-	-	-	-	-	1
CO4	3	1	2	1	-	-	-	-	-	-	-	1
CO5	3	-	-	1	1	-	-	-	-	-	-	1

**B. COs AND PSOs MAPPING**

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	-	-	2	-
CO2	3	-	-	2	-
CO3	3	-	-	2	-
CO4	3	-	-	2	1
CO5	3	1	-	-	1

**Note:** On the basis of mapping of COs with POs, this course is related to Employability / Skill Development.

**A. DETAILED SYLLABUS**

Unit	Contents
	Students will be grouped in two to three, will have to decide final thesis area, download research papers from IEEE, ACM, Elsevier, Springer etc. Summarizing paper – Reading abstracts and finding ideas, conclusion, Advantages of Their approach, and the drawbacks of the papers. Generalize results from a research paper to related research problems. Comparing the approach - Identify weaknesses and strengths in recent research articles in the subject. Practice sessions on how to read, analyze and summarize research papers. Students in group will have to deliver seminar, prepare a report and a review paper based on analysis.

POORNIMA UNIVERSITY, JAIPUR									
Faculty of Engineering and Technology									
Name of Program:	M.Tech. in Transportation Engineering			Duration: 2 Years			Total Credits: 81		
Teaching Scheme for Batch 2025-27									
Semester-II									
Course Code	Name of Course	Teaching Scheme				Marks Distribution			Credits
		Lecture (L)	Tutorial (T)	Practical	SH	IE	ESE	Total	
<b>A. Major (Core Courses)</b>									
<b>A.1 Theory</b>									
MTECCV2101	Highway Traffic Analysis and Design	3	-	-		40	60	100	3
MTECCV2102	Highway Construction Practice	3	-	-		40	60	100	3
MTECCV2103	Public Transportation	3				40	60	100	3
<b>A.2 Practical</b>									
MTECCV2201	Transportation Engineering Lab-II	-	-	2		60	40	100	1
<b>B. Minor Stream Courses/ Department Electives I and II</b>									
<b>B.1 Theory</b>									
MTEECV2101	Analysis of Transportation Systems	3	0	-	-	40	60	100	3
MTEECV2102	Transportation Planning			-	-	40	60	100	
MTEECV2103	Environmental Impact Assessment			-	-	40	60	100	
MTEECV2104	Transportation Network Analysis and Optimization	3	0	-	-	40	60	100	3
MTEECV2105	Transportation Project Evaluation and Decision Making			-	-	40	60	100	
MTEECV2106	Intelligent Transportation Systems			-	-	40	60	100	
<b>B.2 Practical</b>									
	-	-	-	-	-	-	-	-	-
<b>C. Multidisciplinary Courses</b>									
	MOOC Course - I	3	-	-	-	-	-	-	3
<b>D. Ability Enhancement Courses (AEC)</b>									
MUACHM2207	Communication Skill - II	-	-	2		60	40	100	1
<b>E. Skill Enhancement Courses (SEC)</b>									
MULCSE2201	Skill Enhancement Technical Course-II	-	-	4		60	40	100	2
MULCCV2202	Review/Research Paper-I	-	-	2		60	40	100	1
<b>F. Value Added Courses (VAC)</b>									
	-	-	-	-	-	-	-	-	-
<b>G. Summer Internship / Research Project / Dissertation</b>									
MTECCV2401	Seminar-II	-	-	2	-	60	40	100	1
<b>Total</b>		18	0	12					<b>24</b>
<b>Total Teaching Hours</b>		<b>30</b>							

# M. Tech. TRANSPORTATION ENGINEERING

## Syllabus-Second Semester

**Code: MTECCV2101      Highway Traffic Analysis and Design 3 Credits ILTP: 3-0-01**

### COURSE OVERVIEW AND OBJECTIVES

This course stands with objectives of learning analysis and design process of highways. In this course the study of traffic volume computation, pavement geometric design, design of road intersections and the road safety practice is to be carried out.

### COURSE OUTCOME

After completion of this course, student will be able to:

CO No.	Description
CO1	Analyze the elements of traffic engineering for pavement design.
CO2	Demonstrate surveying techniques of traffic for design of various components of transportation.
CO3	Design the process of facilities of road transportation.
CO4	Design of intersections, rotaries, signs and signal of road facilities.
CO5	Evaluate the measures for road safety by pavement analysis and design.

### DETAILED SYLLABUS

<b>Unit 1</b>	Elements of Traffic Engineering - road user, vehicle and road way and driver characteristics. - Design speed, volume. Passenger Car Units - Static and Dynamic- Highway capacity and level of service - capacity of urban and rural
<b>Unit 2</b>	Traffic volume studies, origin destination studies, speed studies, travel time and delay studies, Parking studies, Accident studies. - Road user facilities – Parking facilities - Cycle tracks - Pedestrian facilities.
<b>Unit 3</b>	Elements of design - Alignment - Cross sectional elements - Stopping and passing sight distance. Horizontal curves - Vertical curves. Design problems. Traffic regulation and control - Signs and Markings - Traffic System Management.
<b>Unit 4</b>	Design of intersections – At-grade intersections- Principles of design – Channelization - Design of rotaries - Traffic signals - pre-timed and traffic actuated. Design of signal setting - phase diagrams, timing diagram – Signal co- ordination – Area traffic Control System. Grade separated interchanges - Geometric elements for divided and access-controlled highways and expressways
<b>Unit 5</b>	Traffic Safety – Principles and Practices – Safety along links - Safety at intersections. Road Safety Audi- Countermeasures, evaluation of effectiveness of counter-measures– Road safety programmes

### RECOMMENDED STUDY MATERIAL:

S.No	Title of the Book	Author
1	ITE Hand Book, Highway Engineering	McGraw – Hill AASHTO
2	A Policy on Geometric Design of Highway and Streets	Pignataro, L.J., John Wiley, 1985
3	Highway Traffic Analysis and Design	R. J. Salter and N. B. Hounsel, Macmillan Press Ltd, 1996.

S. No	Important web links
1.	<a href="https://nptel.ac.in/courses/105/105/105105107/">https://nptel.ac.in/courses/105/105/105105107/</a>
2.	<a href="https://www.youtube.com/watch?v=pMcOgiWIGDU">https://www.youtube.com/watch?v=pMcOgiWIGDU</a>

#### D. COs and POs Mapping

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2	-	1	-	1	-	-	-	-	-
CO2	1	1	2	-	1	-	-	-	1	-	-	1
CO3	3	-	-	2	1	-	-	-	-	1	-	-
CO4	-	3	-	1	-	-	-	-	-	-	-	-
CO5	1	-	1	3	-	-	-	-	-	-	-	1

#### E. COs and POs Mapping

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	-	3	-	-
CO2	1	3	-	1	1
CO3	2	-	3	-	-
CO4	2	3	-	1	-
CO5	-	-	-	2	3

**Note:** On the basis of mapping of COs with POs, this course is related to Employability / Skill Development

**COURSE OVERVIEW AND OBJECTIVES**

This subject is very practical for the learners. In this subject student have to practice the IRC and IS code for the construction of highways and to select the suitable materials for pavements.

**A. COURSE OUTCOME**

After completion of this course, student will be able to:

S.No.	Description
CO1	Evaluate construction of embankment cutting in Soil and hard rock by using Water Bound Macadam, Wet Mix Macadam, Cement treated bases, Dry Lean Concrete (DLC) and highway drainage system design.
CO2	Interpret Bituminous Constructions wearing, deck slabs, Construction techniques and Quality Control.
CO3	Design concrete road and construction joints.
CO4	Analyze Construction of Continuously reinforced, Pre-stressed and Steel Fiber Reinforced Pavements.
CO5	Design hill roads based on Slopes, Landslides, Causes, drainage and Control measures.

**B. DETAILED SYLLABUS**

<b>Unit 1</b>	Embankment Construction: Formation cutting in Soil and hard rock, Preparation of Subgrade, Ground improvement, Retaining and Breast walls on hill roads, Granular and Stabilized, Sub – bases / bases, Water Bound Macadam (WBM), Wet Mix Macadam (WMM), Cement treated bases, Dry Lean Concrete (DLC), highway drainage system design
<b>Unit 2</b>	Bituminous Constructions: Types of Bituminous Constructions, Interface Treatments, Bituminous Surfacing and wearing Courses for roads and bridge deck slabs, Selection of wearing Course under different Climatic and Traffic conditions, IRC specifications, Construction techniques and Quality Control.
<b>Unit 3</b>	Concrete road construction: Test on Concrete mixes, Construction equipment, Method of construction of joints in concrete pavements, Quality Control in Construction of Concrete pavements,
<b>Unit 4</b>	Construction of Continuously reinforced, Prestressed, Steel Fiber Reinforced (SFRC) Pavements, IRC, MORT&H, ACI Specifications, AASHTO Specifications, Recycled pavements, non – Conventional Pavements, Overlay Construction.
<b>Unit 5</b>	Hill Roads Construction: Stability of Slopes, Landslides – Causes and Control measures, Construction of Bituminous and Cement Concrete roads at high altitudes, Hill road drainage, Construction and maintenance problems and remedial measures

**C. RECOMMENDED STUDY MATERIAL:**

S. No	Title of the Book	Author
1	Principles and Practices of Highway Engineering	L. R. Kadiyal and B. N. Lal
2	MORT&H, IRC	Krishna Raju N. (1989), CBS Publishers and distributors, New Delhi.

S. No	Important web links
1.	<a href="https://nptel.ac.in/courses/105/102/105102088/">https://nptel.ac.in/courses/105/102/105102088/</a>

2. <https://nptel.ac.in/courses/105/101/105101143/>

#### D. COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	-	-	3	-	-	-	-	-	1	-
CO2	1	1	-	-	3	-	-	-	-	-	1	-
CO3	1	-	-	-	3	-	-	-	1	-	1	-
CO4	1	1	-	-	3	-	-	-	-	-	1	-
CO5	1	1	-	-	3	-	-	-	1	-	1	-

#### E. COs AND POs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	3	-	2	-
CO2	1	3	-	2	-
CO3	1	3	-	2	-
CO4	1	3	-	2	-
CO5	1	3	-	2	-

**Note:** On the basis of mapping of COs with POs, this course is related to Entrepreneurship.

**COURSE OVERVIEW AND OBJECTIVES**

This subject is very practical for the learners. In this subject student have to practice the IRC and IS code for the construction of highways and to select the suitable materials for pavements.

**A. COURSE OUTCOME**

After completion of this course, student will be able to:

CO No.	Description
CO1	Recall various modes of public transportation and their applications in urban travel systems.
CO2	Explain the operations of transit systems including para-transit, street, and rapid transit, and estimate transit demand.
CO3	Apply principles for developing efficient transit routes, stop locations, and schedules based on system requirements.
CO4	Analyze the capacity of rapid and street transit systems and identify appropriate transit corridors and integration strategies.
CO5	Evaluate fare policies, subsidy models, and the role of Intermediate Public Transport (IPT) in Indian urban contexts.

**B. DETAILED SYLLABUS**

<b>Unit 1</b>	Introduction to Public Transportation, Modes of public transportation, and applications of each mode to urban travel needs, Importance of public transport in sustainable urban mobility.
<b>Unit 2</b>	Transit Operations and Planning Basics, Transit system operations, Para-transit systems, Street transit systems, Rapid transit systems, Estimation of transit demand.
<b>Unit 3</b>	Route and Schedule Planning, Route development strategies, Properties of a good route set, Determination of a good route set, Stop location and stopping policy, Schedule development, Properties of a good schedule, Determination of a good schedule.
<b>Unit 4</b>	Capacity and Corridor Planning, Capacity of rapid transit systems, Line capacity of RTS, Capacity of street transit systems, Transit corridor identification and planning, Mass transport management measures, Integration of public transportation modes.
<b>Unit 5</b>	Infrastructure, Fares, and Intermediate Public Transport (IPT), Public transport infrastructure, Case studies on successful systems, Multi-modal transportation systems, Fare policies and subsidies, Intermediate public transport in Indian cities, Types and characteristics of IPT vehicles and modes

**C. RECOMMENDED STUDY MATERIAL:**

S. No	Title of the Book	Author
1	Urban Transit: Operations, Planning, and Economics	Vukan R. Vuchic
2	Public Transport Planning and Management in Developing Countries	Ashish Verma & T.V. Ramanayya
3	Transportation Engineering and Planning	C.S. Papacostas & P.D. Prevedouros
4	Principles of Transportation Engineering	Partha Chakroborty & Animesh Das

S. No	Important web links
1.	<a href="https://morth.nic.in">https://morth.nic.in</a>
2.	<a href="https://www.irc.nic.in">https://www.irc.nic.in</a>

#### D. COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	1	-	-	-	-	1
CO2	3	3	2	-	-	1	-	-	-	-	-	2
CO3	2	3	3	2	2	-	-	-	-	-	-	2
CO4	2	2	3	3	3	-	1	-	-	-	-	2
CO5	2	2	2	2	2	3	3	1	-	1	-	3

#### E. COs AND POs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	-	-	-
CO2	3	3	1	-	-
CO3	2	3	3	-	-
CO4	2	3	3	1	-
CO5	1	2	3	2	1

**Note:** On the basis of mapping of COs with POs, this course is related to Entrepreneur

Code: MTECCV2201

Transportation Engineering Lab-II

1 Credits II/TP: 0-0-21

**A. DETAILED SYLLABUS**

**List of Experiments**

Design as per syllabus of theory

S. No	Important web links
1.	<a href="https://nptel.ac.in/courses/105/107/105107123/">https://nptel.ac.in/courses/105/107/105107123/</a>

## B. Department Elective Courses

Code: MTEECV2101

Analysis of Transportation Systems

3 Credits [LTP: 3-0-0]

### COURSE OVERVIEW AND OBJECTIVES

This course deals with the analysis process which is used in data collection for design of various facilities of roads. In this course study of the traffic survey, traffic assignment, role measurement of public transportation and traffic control is to be carried out.

### COURSE OUTCOME

After completion of this course, student will be able to:

CO No.	Description
CO1	Analyze the components and the factors governing the transportation system design.
CO2	Interpret the basics of traffic survey and its assignment.
CO3	Demonstrate the methods of dynamic traffic assignment.
CO4	Compare all the components of public transport systems.
CO5	Evaluate models for traffic control.

### A. DETAILED SYLLABUS

<b>Unit 1</b>	Introduction: transportation systems, transportation innovations, social and economic impacts of portation, Decision makers and their options, demand modeling and predictions, Modeling portation systems. Analysis of network flows: Shortest- Path Problems, Maximum-flow Problems, imum-cost network flow problems, Minimum Spanning tree problem, The network simplex method
<b>Unit 2</b>	Static Traffic Assignment: All-or-nothing (AON) assignment, Link cost function, Equilibrium ciples: User Equilibrium (UE) and System Optimal (SO), Formulations of SO and UE, Uniqueness of and SO formulations, multi-mode traffic assignment, Variable Demand assignment, Stochastic Traffic Assignment, Solution of traffic assignment problems.
<b>Unit 3</b>	Dynamic Traffic Assignment (DTA): Introduction, Point queue model, Cell Transmission Model, le link model, Dynamic user equilibrium (DUE), Analytical Models of DUE, Solution of DUE Simulations, Simulation based DUE.
<b>Unit 4</b>	Public Transportation Systems: Transit Assignment, Transit route network planning, performance monitoring, vehicle and crew scheduling. Decision Making in sortation Networks: Congestion pricing, network design problems, prioritizing investment.
<b>Unit 5</b>	Optional Topics: Integrated land-use and transport modelling, Activity based travel and modelling, Entropy in the analysis of utility maximizing systems, Entropy maximization and gravities.

**B. RECOMMENDED STUDYMATERIAL:**

S. No	Title of the Book	Author
1	Transportation Systems Analysis: Models and Application, Springer, 2009	Cascetta, E.
2	Urban Transportation Networks: Equilibrium Analysis with Mathematical Programming Method. Prentice-Hall, EnglewoodCliffs, 1985	Sheffi, Y.
3	Modeling Dynamic Transportation Network –An Intelligent Transportation System Oriented Approach, Springer-Verlag, Heidelberg, 1996	Ran, B., and Boyce, D. E.
4	Applied Systems Analysis: Engineering Planning and Technology Management, McGraw Hill, 1990	De Neufville, R.

S. No	Important web links
1.	<a href="https://nptel.ac.in/courses/105/106/105106188/">https://nptel.ac.in/courses/105/106/105106188/</a>
2.	<a href="https://nptel.ac.in/courses/105/107/105107123/">https://nptel.ac.in/courses/105/107/105107123/</a>

**D. COs and Pos Mapping**

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2	-	1	-	1	-	-	-	-	-
CO2	1	1	2	-	1	-	-	-	1	-	-	1
CO3	3	-	-	2	1	-	-	-	-	1	-	-
CO4	-	3	-	1	-	-	-	-	-	-	-	-
CO5	1	-	1	3	-	-	-	-	-	-	-	1

**E. COs and PSO Mapping**

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	-	3	-	-
CO2	1	3	-	1	1
CO3	2	-	3	-	-
CO4	2	3	-	1	-
CO5	-	-	-	2	3

**Note:** On the basis of mapping of COs with POs, this course is related to Employability / Skill Development

**COURSE OVERVIEW AND OBJECTIVES**

This course deals with the planning of road network and transportation facilities. In this subject the students learn the different models for preparing plan for maximum road capacity.

**COURSE OUTCOME**

After completion of this course, student will be able to:

CO No.	Description
CO1	Define the objectives of urban planning and management of travel demand.
CO2	Demonstrate trip generation and trip distribution modal.
CO3	Analyze modal split modal and it's use in traffic engineering.
CO4	Interpret the land use modal of transportation planning.
CO5	Evaluate alternative plan and monitoring projects.

**A. DETAILED SYLLABUS**

<b>Unit 1</b>	Urban morphology - Urbanization and travel demand – Urban activity systems and travel patterns – Systems approach – Trip based and Activity based approach - Urban Transportation Planning – Goals, Objectives and Constraints - Inventory, Model building, Forecasting and Evaluation - Study area delineation – Zoning - UTP survey
<b>Unit 2</b>	Trip generation models – Trip classification - productions and attractions – Trip rate analysis - Multiple regression models - Category analysis - Trip distribution models – Growth factor models, Gravity model and Opportunity modes.
<b>Unit 3</b>	Modal split models – Mode choice behavior – Trip end and trip interchange models - Probabilistic models - Utility functions - Logit models - Two stage model. Traffic assignment – Transportation networks – Minimum Path Algorithms - Assignment methods – All or Nothing assignment, Capacity restrained assignment and Multi path assignment - Route-choice behavior.
<b>Unit 4</b>	Land use transportation models – Urban forms and structures - Location models - Accessibility - Land use models - Lowry derivative models - Quick response techniques - Non-Transport solutions for transport problems
<b>Unit 5</b>	Preparation of alternative plans-Evaluation techniques - Plan implementation- Monitoring - Financing of Project – urban development planning policy - Case studies.

**B. RECOMMENDED STUDY MATERIAL:**

S. No	Title of the Book	Author
1.	Principles of Urban Transport Systems Planning, Scripta, McGraw-	Hutchinson, B.G.
2.	Transportation Engineering - An Introduction, Prentice Hall, NJ, 2007	Khisty C.J.
3.	Transportation Engineering & Planning, PHI, New Delhi, 2002	Papacostas C.S. and Prevedouros, P.D.

S. No	Important web links
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1.	<a href="http://www.digimat.in/nptel/courses/video/105106058/L13.html">http://www.digimat.in/nptel/courses/video/105106058/L13.html</a>
2.	<a href="https://www.youtube.com/watch?v=YAEyLOCU-8I">https://www.youtube.com/watch?v=YAEyLOCU-8I</a>

#### D. COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	-	-	3	-	-	-	-	-	1	-
CO2	1	1	-	-	3	-	-	-	-	-	1	-
CO3	1	-	-	-	3	-	-	-	1	-	1	-
CO4	1	1	-	-	3	-	-	-	-	-	1	-
CO5	1	1	-	-	3	-	-	-	1	-	1	-

#### E. COs AND POs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	3	-	2	-
CO2	1	3	-	2	-
CO3	1	3	-	2	-
CO4	1	3	-	2	-
CO5	1	3	-	2	-

**Note:** On the basis of mapping of COs with POs, this course is related to Entrepreneur

**COURSE OUTCOME**

After completion of this course, student will be able to:

CO No.	Description
CO1	Define the environmental impact assessment for EIA, TOR, and IEE.
CO2	Analyze Tools for assess environmental impact based on Checklist, Network, Matrices, Overlays, Mathematical Modeling, Adhoc committee.
CO3	Interpret Air, Noise and Environmental Impact Assessment for land use and water quantity.
CO4	Demonstrate plankton, nekton, benthos and importance coastal habitat for biological aquatic ecology.
CO5	Evaluate environmental impact assessment for quality of life, socio-economic Mitigation and Monitoring process.

**A. DETAILED SYLLABUS**

<b>Unit 1</b>	Definition and history of environmental impact assessment, related law necessary for EIA Process for EIA, TOR, IEE.
<b>Unit 2</b>	Components of EIA Reports Tools for assess environmental impact: Checklist, Network, Matrices, Overlays, Mathematical Modeling, Adhoc committee
<b>Unit 3</b>	Environmental Impact Assessment for air and noise, Environmental Impact Assessment for soil and land use, Environmental impact Assessment for water quantity.
<b>Unit 4</b>	Assessment for biological: terrestrial ecology forest and wildlife Environmental Impact Assessment for biological aquatic ecology: plankton, nekton, benthos and importance coastal Habitat.
<b>Unit 5</b>	Environmental Impact Assessment for human use Environmental Impact, Assessment for quality of life, socio-economic Mitigation and Monitoring process for environmental impact assessment

**B. RECOMMENDED STUDY MATERIAL:**

S. No	Title of the Book	Author
1	Environmental Impact Assessment. McGraw-Hill, Inc. Printed in the	Canter L.W.1977.
2	Environmental Impact Statements. John Wiley &	Eccleston, H.C.2000.

S. No	Important web links
1.	<a href="https://www.youtube.com/watch?v=LwtGqpMTEnk">https://www.youtube.com/watch?v=LwtGqpMTEnk</a>
2.	<a href="https://www.youtube.com/watch?v=-zqAjBpG0Jw">https://www.youtube.com/watch?v=-zqAjBpG0Jw</a>

#### D.CO's AND PO's MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	-	1	-	-	-	-	-	-	1
CO2	1	2	2	-	1	-	1	-	-	-	-	-
CO3	1	1	2	-	1	-	-	-	1	-	-	1
CO4	1	-	2	-	2	-	-	1	-	-	-	1
CO5	1	1	2	-	1	-	-	-	1	-	-	1

#### E.CO's AND PSO's MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	-	2	3	-	1
CO2	3	1	-	2	-
CO3	1	3	-	1	1
CO4	2	-	1	-	3
CO5	3	2	1	-	1

**Note:** On the basis of mapping of COs with POs, this course is related to Employability / Skill Development

**COURSE OUTCOME**

After completion of this course, student will be able to:

CO No.	Description
CO1	Analyze the Network flows, graphs, paths, trees, cycles loops, walk, network and basic network transformations.
CO2	Interpret the Transportation Costs, Vehicle Operating Costs and Value of Travel Time Savings.
CO3	Evaluate Algorithms using Shortest Path, Dijkstra and Dial methods.
CO4	Analyze Minimum cost of network assignment as per principles, optimization and Frank-Wolfe algorithm.
CO5	Demonstrate the TRIPS, SATURN, EMME/2, CUBE software's.

**A. DETAILED SYLLABUS**

<b>Unit 1</b>	Network flows Applications, definitions, graphs, paths, trees, cycles loops, walk, network representation (adjacency list and matrices) and basic network transformations; Network algorithms; Complexity, Search Algorithms, Strategies for designing polynomial algorithms.
<b>Unit 2</b>	Shortest Path Algorithms Label setting, Dijkstra's and Dial's algorithms, Optimality conditions, label correcting algorithms and optimality conditions, detecting negative cycles, all-pair shortest path algorithms; pre-flow push polynomial time algorithms, capacity scaling techniques
<b>Unit 3</b>	Minimum cost network assignment optimality conditions, cycle-canceling algorithm, Successive shortest path algorithm, other polynomial time variants; Network equilibrium analysis; principles and optimization formulations, Frank-Wolfe algorithm; Special cases and variants
<b>Unit 4</b>	Applications of min-cost, max-flow, and shortest path algorithms to transportation and infrastructure networks transportation networks, airline, freight, facility location, logistics, network design, project scheduling, reliability of distribution systems, telecommunication/power networks
<b>Unit 5</b>	Computer Software Principles of TRIPS, SATURN, EMME/2, CUBE; Demo Versions, Case studies

**B. RECOMMENDED STUDY MATERIAL:**

S.	Title of the	Author
1	Network Flows Theory, Algorithms and Application, PrenticeHall, New Jersey, 1993.	Ahuja, R., Magnanti, T.L., and Orlin, J.B.
2	Transportation Networks, Elsevier Science	Bell, M.G.

S. No	Important web links
1.	<a href="https://nptel.ac.in/courses/111/105/111105039/">https://nptel.ac.in/courses/111/105/111105039/</a>
2.	<a href="https://nptel.ac.in/courses/106/105/106105154/">https://nptel.ac.in/courses/106/105/106105154/</a>

### COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	1	-	-	-	-	-	-	-	1
CO2	3	1	-	1	-	-	-	-	-	-	-	1
CO3	3	2	-	1	-	-	-	-	-	-	-	1
CO4	3	1	2	1	-	-	-	-	-	-	-	1
CO5	3	-	-	1	1	-	-	-	-	-	-	1

### Cos AND PSOs MAPPING

Cos and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	-	-	2	-
CO2	3	-	-	2	-
CO3	3	-	-	2	-
CO4	3	-	-	2	1
CO5	3	1	-	-	1

**Note:** On the basis of mapping of COs with POs, this course is related to Employability / Skill Development

**COURSE OUTCOME**

After completion of this course, student will be able to:

CO No.	Description
CO1	Analyze the Transportation Decision Making and Estimating Transportation Demand and Supply.
CO2	Interpret the Transportation Costs, Vehicle Operating Costs and Value of Travel Time Savings.
CO3	Demonstrate Accidents Costs based on safety impact evaluation, issues connected and estimating crash reduction factors.
CO4	Analyze Economic Evaluation of Transportation Projects.
CO5	Evaluate the Transportation Projects and Programs, Case study and Financial Analysis of Transportation Projects.

**A. DETAILED SYLLABUS**

<b>Unit 1</b>	Introductory Concepts in Transportation Decision Making: Overall transportation project development, budgeting, financial planning, the process of transportation project development, models associated with transportation impact evaluation, procedural framework for transportation systems evaluation. Estimating Transportation Demand and Supply: Demand- supply equilibration, dynamics of transportation demand and supply, elasticity of travel demand and supply, classification of elasticity, consumer surplus and latent demand
<b>Unit 2</b>	Transportation Costs: Classification of transportation costs, transportation agency costs, transportation user costs, general structure and behavior of cost functions and road pricing. Vehicle Operating Costs: Road user cost study in India, components of VOC, factors affecting VOC, fuel consumption relationships, procedural framework for assessing VOC impacts. Value of Travel Time Savings: Categorizations of travel time, framework for assessing travel time impacts, economic concept of evaluation of travel time savings, issues relating to travel time value estimation, methodology for monetary evaluation of passengers travel time, review of work in India on passengers travel time.
<b>Unit 3</b>	Accidents Costs: Relevance of accident costing for a developing country, procedural framework for safety impact evaluation, review of alternative methodologies for accident costing, certain issues connected with accident costing, methods for estimating crash reduction factors, before and after case studies.
<b>Unit 4</b>	Economic Evaluation of Transportation Projects: Economic significance of transport, performance measures in transportation evaluation, costs and benefits of transport projects, basic principles of economic evaluation, elements of engineering economics, methods of economic evaluation, benefit-cost ratio method, first year rate of return, net present value method, internal rate of return method, comparison of the various methods of economic evaluation, life cycle cost analysis, case studies, software packages for economic efficiency analysis.(HDM-4).
<b>Unit 5</b>	Evaluation of Transportation Projects and Programs using Multiple Criteria: Basic concepts, Single vs. multiple criteria, Evaluation, decision-making, and optimization, Steps in multi-criteria decision-making, Case study: evaluation of metro rail projects using multi-criteria. Financial Analysis of Transportation Projects: Financial analysis of high way project case study, PPP based transport project case study.

**B. RECOMMENDED STUDYMATERIAL:**

S. No	Title of the Book	Author
1.	Transportation Economics, Blackwell, 2001	McCarthy, P.
2.	Essays in Transportation economics and Policy, Brookings Institution Press, 1999	Meyer John Robert Meyer, JosA. Gmez- Ibez, William B. Tye, Clifford

3.	Principles of transportation economics, Addison-Wesley,	Kenneth Duncan Boyer
4.	Transportation Decision Making: Principles of Project	Kumares C. Sinha, Samuel Labi

S. No	Important web links
1.	<a href="https://nptel.ac.in/courses/112/107/112107238/">https://nptel.ac.in/courses/112/107/112107238/</a>

**D.CO and POs Mapping**

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	1	-	-	-	-	-	-	-	1
CO2	3	1	-	1	-	-	-	-	-	-	-	1
CO3	3	2	-	1	-	-	-	-	-	-	-	1
CO4	3	1	2	1	-	-	-	-	-	-	-	1
CO5	3	-	-	1	1	-	-	-	-	-	-	1

**E.CO and PSO Mapping**

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	-	-	2	-
CO2	3	-	-	2	-
CO3	3	-	-	2	-
CO4	3	-	-	2	1
CO5	3	1	-	-	1

**Note:** On the basis of mapping of COs with POs, this course is related to Employability / Skill Development

**COURSE OVERVIEW AND OBJECTIVES**

The objective of this course is to provide basic ideas about the intelligent transportation systems and to advance the transportation facilities.

**COURSE OUTCOME**

After completion of this course, student will be able to:

CO No.	Description
CO1	Compare between the historical background and features of intelligent transportation systems.
CO2	Interpret the telecommunication systems in advancement of ITS.
CO3	Analyze functional area of ITS and its effects.
CO4	Demonstrate the usability of ITS in road safety.
CO5	Evaluate the automated highway systems and its implementation in developed or in developing countries.

**A. DETAILED SYLLABUS**

<b>Unit 1</b>	Introduction to Intelligent Transportation Systems (ITS) – Definition of ITS and Identification of ITS Objectives, Historical Background, Benefits of ITS - ITS Data collection techniques, Detectors, Automatic Vehicle Location (AVL), Automatic Vehicle Identification (AVI), Geographic Information Systems (GIS), video data collection.
<b>Unit 2</b>	Telecommunications in ITS – Importance of telecommunications in the ITS system, Information Management, Traffic Management Centers (TMC). Vehicle – Road side communication – Vehicle Positioning System
<b>Unit 3</b>	ITS functional areas – Advanced Traffic Management Systems (ATMS), Advanced Traveler Information Systems (ATIS), Commercial Vehicle Operations (CVO), Advanced Vehicle Control Systems (AVCS), Advanced Public Transportation Systems (APTS), Advanced Rural Transportation Systems (ARTS).
<b>Unit 4</b>	ITS User Needs and Services – Travel and Traffic management, Public Transportation Management, Electronic Payment, Commercial Vehicle Operations, Emergency Management, Advanced Vehicle safety systems, Information Management.
<b>Unit 5</b>	Automated Highway Systems - Vehicles in Platoons – Integration of Automated Highway Systems. ITS Programs in the World – Overview of ITS implementations in developed countries, ITS in developing countries.

**B. RECOMMENDED STUDY MATERIAL:**

S. No	Title of the Book	Author
1.	ITS Hand Book 2000 Recommendations for World Road Association(PIARC)	Kan Paul Chen, John Miles
2.	Perspective on ITS, Artech House Publishers, 2005.	Sussman, J. M.
3	ITS Architecture Documentation, US Department of Transportation, 2007	

S. No	Important web links
1.	<a href="https://www.youtube.com/watch?v=suTYujyKiwA">https://www.youtube.com/watch?v=suTYujyKiwA</a>
2.	<a href="https://www.youtube.com/watch?v=NVf9vtazgX8">https://www.youtube.com/watch?v=NVf9vtazgX8</a>

#### A. COs AND POs MAPPING

COs and LOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	1	-	-	-	-	-	-	-	1
CO2	3	1	-	1	-	-	-	-	-	-	-	1
CO3	3	2	-	1	-	-	-	-	-	-	-	1
CO4	3	1	2	1	-	-	-	-	-	-	-	1
CO5	3	-	-	1	1	-	-	-	-	-	-	1

#### B. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	-	-	2	-
CO2	3	-	-	2	-
CO3	3	-	-	2	-
CO4	3	-	-	2	1
CO5	3	1	-	-	1

**Note:** On the basis of mapping of COs with POs, this course is related to Employability / Skill Development

**COURSE OUTCOMES**

Students will be able:

- CO1: To present themselves in an effective manner and know about their short-term and long-term goals.
- CO2 To works in a team by managing time properly and focus on personal grooming, etiquettes and body language.
- CO3 To demonstrate their abilities by improving skills of LSRW (Listening /Speaking/Reading/Writing).
- CO4 To present different viewpoints or ways of thinking about a situation , expand their abilities to resolve situations and get experience within the given context
- CO5 To enhance their employability skills by working on the presentation of Résumé and giving impactful performance during Group Discussion.

**DETAILED SYLLABUS**

Unit	Unit Details
1	Self-Awareness, Self Esteem & Confidence
2	The Corporate Fit-Dressing and Grooming, Etiquette: Social etiquette, business etiquette – civic sense – social norms
3	Effective Management Skills Time & Stress Management: Act in time on commitment
4	Personal Grooming and Body language
5	Time Management & Conflict Management
6	Planning & Prioritizing, Emotional Intelligence: Managing Emotions
7	Oral Communication & Writing Skills: Extempore & Paper Presentations.
8	Selling Self/Job Hunting Writing resume / Curriculum vitae
9	Mock GD – Goal setting - Career planning
10	Mock interview or Interview skills

**C. COs AND POs MAPPING**

COs and LOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	1	-	-	-	-	-	-	-	1
CO2	3	1	-	1	-	-	-	-	-	-	-	1
CO3	3	2	-	1	-	-	-	-	-	-	-	1
CO4	3	1	2	1	-	-	-	-	-	-	-	1
CO5	3	-	-	1	1	-	-	-	-	-	-	1

**D. COs AND PSOs MAPPING**

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	-	-	2	-
CO2	3	-	-	2	-
CO3	3	-	-	2	-
CO4	3	-	-	2	1
CO5	3	1	-	-	1

**Note:** On the basis of mapping of COs with POs, this course is related to Employability / Skill Development.

**A. COURSE OVERVIEW AND OBJECTIVES**

To familiarize students with basic of research and the research process. To enable the students in conducting research work and formulating research synopsis and report. Develop understanding on various kinds of research, objectives of doing research, research process, research designs and sampling

**COURSE OUTCOME**

The student will be able to:

CO1 To be able to distinguish a purpose statement, a research question or hypothesis, and a research objective.

CO2 To be able to define the meaning of a variable, and to be able to identify independent, dependent, and mediating variables

CO3 To be able to distinguish between categorical and continuous measures

CO4 To be able to design a good quantitative purpose statement and good quantitative research questions and hypotheses.

CO5 To understand the link between quantitative research questions and data collection and how research questions are operationalized in educational practice.

**A. DETAILED SYLLABUS**

Unit	Contents
<b>1.</b>	<b>Foundations of Research</b>
	Foundations of Research: Meaning, Objectives, Motivation, Utility. Concept of theory, empiricism, deductive and inductive theory.
<b>2.</b>	<b>Problem Identification &amp; Formulation</b>
	Problem Identification & Formulation – Research Question – Investigation Question – Measurement Issues – Hypothesis
<b>3.</b>	<b>Research Design</b>
	Research Design: Concept and Importance in Research – Features of a good research design – Exploratory Research Design – concept, types and uses.
<b>4.</b>	<b>Qualitative and Quantitative</b>
	Qualitative and Quantitative Research: Qualitative research – Quantitative research – Concept of measurement, causality, generalization, replication. Merging the two approaches.
<b>5.</b>	<b>Data Analysis</b>
	Data Analysis: Data Preparation – Univariate analysis (frequency tables, bar charts, pie charts, percentages), Bivariate analysis.
<b>6.</b>	<b>Interpretation of Data and Paper Writing</b>
	Interpretation of Data and Paper Writing – Layout of a Research Paper, Journals in Computer Science, Impact factor of Journals.
<b>7.</b>	<b>Use of Encyclopedias, Research Guides, Handbook</b>
	Use of Encyclopedias, Research Guides, Handbook etc., Academic Databases for Computer Science Discipline
<b>8.</b>	<b>Use of tools / techniques for Research</b>
	Use of tools / techniques for Research: methods to search required information effectively, Reference Management Software like Zotero/Mendeley,

**B. RECOMMENDED STUDY MATERIAL:**

<b>S.No</b>	<b>Title of the Book</b>	<b>Author</b>
1.	Research Methodology	R. Panneerselvam, PHI
2.	Research Methodology: Methods and Trends	Dr. C. R. Kothari
3.	Research Methodology: A Step by Step Guide for Beginners	Ranjit Kumar

## A. DETAILED SYLLABUS

Unit	Contents
	<p>Students grouped in two to three during Semester I, will now continue to download further the research papers in the area, analyze, allocate individually, the set of papers,</p> <p><b>Literature survey</b> Overview- What is literature survey, Functions of literature survey, maintaining a notebook, developing a Bibliography Methods of data collection – Observation, survey, contact methods, experimental, determining sample design Searching for publications – Publication databases, search engines and patent databases, Find some/all of the references for a given paper, including those that are not on the web Online tools-google, Cite Seer, ACM Digital Library, IEEE, The on-line Computer Science bibliography, Survey papers, Finding material not on the web, Searching patents.</p> <p><b>Publishing a paper</b> How to write scientific paper Structure of a conference and journal paper, how (and How Not) to write a Good Systems Paper: Abstract writing, chapter writing, discussion, conclusion, references, bibliography, and In-class discussion of technical writing examples, Poster papers, review papers, how to organize thesis Project report, How to write a research proposal? How research is funded? Research ethics – Legal issues, copyright, and plagiarism General advice about writing technical papers in English Tips for writing correct English Practice sessions on above will be conducted. Students will have to deliver seminar, prepare a report and a review paper based on analysis individually.</p>

POORNIMA UNIVERSITY, JAIPUR									
Faculty of Engineering and Technology									
Name of Program:	M.Tech. in Transportation Engineering			Duration: 2 Years			Total Credits: 81		
<u>Teaching Scheme for Batch 2025-27</u>									
Semester-III									
Course Code	Name of Course	Teaching Scheme				Marks Distribution			Credits
		Lecture (L)	Tutorial (T)	Practical	SH	IE	ESE	Total	
<b>A. Major (Core Courses)</b>									
<b>A.1</b>	<b>Theory</b>								
<b>A.2</b>	<b>Practical</b>								
MTECCV3401	Review/Research Paper-II	0	0	2		60	40	100	1
MTECCV3402	Industrial Technical Seminar	0	0	4		60	40	100	2
<b>B. Minor Stream Courses/ Department Electives/ Open Elective</b>									
<b>B.1</b>	<b>Theory</b>								
<b>C. Multidisciplinary Courses</b>									
	MOOC Course - II	3	-	-	-	-	-	-	3
<b>D. Ability Enhancement Courses (AEC)</b>									
<b>E. Skill Enhancement Courses (SEC)</b>									
-	-	-	-	-	-	-	-	-	-
<b>F. Value Added Courses (VAC)</b>									
<b>G. Summer Internship / Research Project / Dissertation</b>									
MTECCV3403	Internship	-	-	12	-	40	60	100	6
MTECCV3404	Dissertation Part - I	-	-	12	-	60	40	100	6
<b>Total</b>		3	0	30					<b>18</b>
<b>Total Teaching Hours</b>		<b>33</b>							

**PO's and PSO's are as follows**

<b>PO No.</b>	<b>PO's</b>
1	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental
4	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions. Considerations.
5	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6	<b>The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12	<b>Life-long learning:</b> Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
<b>PSO No.</b>	<b>PSO's</b>
1	A civil engineering graduate is efficient in fundamentals of civil engineering, mathematical & scientific reasoning and are able to plan, design the building structure, roads, sewage and water supply networks & other component of infrastructure system considering environmental, safety & health aspects.
2	A civil engineer is able to use modern tools, techniques, software's to solve complex engineering problems.
3	A civil Engineer able to prepare BOQ & cost estimation & able to execute the projects in lined with set project goals.
4	A civil engineer is able to compile detailed project report & give technical specifications to provide required quality of work.
5	A civil engineer is able to access the quality of material used for construction & able to find out deviations & able to suggest preventative and corrective measures for sustainable development.

# M. Tech. Structural Engineering Syllabus-Third Semester

**Code: MTECCV3401**

**Review/Research Paper- II**

**1 Credits [LTP: 0-0-2]**

## A. COURSE OVERVIEW AND OBJECTIVES

To familiarize students with basic of research and the research process. To enable the students in conducting research work and formulating research synopsis and report. Develop understanding on various kinds of research, objectives of doing research, research process, research designs and sampling

### COURSE OUTCOME

The student will be able to:

CO1 To be able to distinguish a purpose statement, a research question or hypothesis, and a research objective.

CO2 To be able to define the meaning of a variable, and to be able to identify independent, dependent, and mediating variables

CO3 To be able to distinguish between categorical and continuous measures

CO4 To be able to design a good quantitative purpose statement and good quantitative research questions and hypotheses.

CO5 To understand the link between quantitative research questions and data collection and how research questions are operationalized in educational practice.

## C. DETAILED SYLLABUS

Unit	Contents
<b>1.</b>	<b>Foundations of Research</b>
	Characteristics of scientific method – Understanding the language of research – Concept, Construct, Definition, Variable. Research Process
<b>2.</b>	<b>Problem Identification &amp; Formulation</b>
	Qualities of a good Hypothesis –Null Hypothesis & Alternative Hypothesis. Hypothesis Testing – Logic & Importance
<b>3.</b>	<b>Research Design</b>
	Descriptive Research Designs – concept, types and uses. Experimental Design: Concept of Independent & Dependent variables.
<b>4.</b>	<b>Qualitative and Quantitative</b>
	Qualitative and Quantitative Research: Qualitative research – Quantitative research – Concept of measurement, causality, generalization, replication. Merging the two approaches.
<b>5.</b>	<b>Data Analysis</b>
	Bivariate analysis – Cross tabulations and Chi-square test including testing hypothesis of association.
<b>6.</b>	<b>Interpretation of Data and Paper Writing</b>
	When and where to publish ? Ethical issues related to publishing, Plagiarism and Self-Plagiarism.
<b>7.</b>	<b>Use of Encyclopedias, Research Guides, Handbook</b>
	Use of Encyclopedias, Research Guides, Handbook etc., Academic Databases for Computer Science Discipline
<b>8.</b>	<b>Use of tools / techniques for Research</b>
	Software for paper formatting like LaTeX/MS Office, Software for detection of Plagiarism

**D. RECOMMENDED STUDY MATERIAL:**

<b>S.No</b>	<b>Title of the Book</b>	<b>Author</b>
1.	Research Methodology	R. Panneerselvam, PHI
2.	Research Methodology: Methods and Trends	Dr. C. R. Kothari
3.	Research Methodology: A Step by Step Guide for Beginners	Ranjit Kumar

## A. DETAILED SYLLABUS

Unit	Contents
	<p>1. For the seminar every student will individually study a topic assigned to him/her and submit a report and shall deliver a short lecture / Seminar on the topic at the end of term.</p> <p>2. Selection of topic should be done by students in consultation with the concerned guide</p> <p>a). The topic should be related to the branch but it should be an extended part of the branch (latest and advanced topic).</p> <p>b). The topic should be such that the student can gain the latest knowledge. Students should preferably refer to at least one research paper</p> <p>3. Seminar topics should not be repeated in the department and registration of the same should be done on a first come first served basis.</p> <p>4. Seminar report should be submitted in paper-bound copy prepared with computer typing</p> <p>a). The size of the report depends on the advancement of the topic.</p> <p>b). Students should preferably refer minimum of 5 reference books/magazines.</p> <p>c). Format of content i. Introduction. ii. Literature survey. iii. Theory 1) Implementation 2) Methodology 3) Application 4) Advantages, Disadvantages. iv. Future scope. v. Conclusion..</p>

**Code: MTECCV3404 Dissertation Part-I**

**6 Credits [LTP:-0-0-12]**

The Project can be carried out in the Institution/Industry/Research laboratory or any other competent institutions.

POORNIMA UNIVERSITY, JAIPUR									
Faculty of Engineering and Technology									
Name of Program:	M.Tech. in Transportation Engineering			Duration: 2 Years			Total Credits: 81		
<u>Teaching Scheme for Batch 2025-27</u>									
Semester-IV									
Course Code	Name of Course	Teaching Scheme				Marks Distribution			Credits
		Lecture (L)	Tutorial (T)	Practical	SH	IE	ESE	Total	
<b>A.</b>		<b>Major (Core Courses)</b>							
<b>A.1</b>	<b>Theory</b>								
-	-	-	-	-	-	-	-	-	-
<b>A.2</b>	<b>Practical</b>								
-	-	-	-	-	-	-	-	-	-
<b>B.</b>		<b>Minor Stream Courses/ Department Electives/ <i>Core Elective</i></b>							
<b>B.1</b>	<b>Theory</b>								
-	-	-	-	-	-	-	-	-	-
<b>B.2</b>	<b>Practical</b>								
-	-	-	-	-	-	-	-	-	-
<b>C</b>		<b>Multidisciplinary Courses</b>							
-	-	-	-	-	-	-	-	-	-
<b>D</b>		<b>Ability Enhancement Courses (AEC)</b>							
-	-	-							
<b>E</b>		<b>Skill Enhancement Courses (SEC)</b>							
-	-	-	-	-	-	-	-	-	-
<b>F</b>		<b>Value Added Courses (VAC)</b>							
-	-	-	-	-	-	-	-	-	-
<b>G</b>		<b>Summer Internship / Research Project / Dissertation</b>							
MTECCV4401	Dissertation Part - II	-	-	30	-	250	250	500	15
<b>Total</b>		0	0	30					<b>15</b>
<b>Total Teaching Hours</b>		<b>30</b>							



**Code: MTECCV4401 Dissertation Part-II 15 Credits [LTP:-0-0-30]**

The Project can be carried out in the Institution/Industry/Research laboratory or any other competent institutions.