Gyanmanjari Innovative University

Course Syllabus
Gyanmanjari Institute of Technology
Semester-7 (B. Tech.)

Subject: Intelligent Transportation System– BETCV17338
Type of Course: Professional Core
Prerequisite: Knowledge of Transportation engineering

Rationale: Intelligent Transportation Systems (ITS) integrate advanced technologies such as communication systems, sensors, data analytics, and automation with transportation infrastructure to improve the safety, efficiency, and sustainability of transport systems. They enable real-time traffic monitoring and management, reducing congestion and travel time. ITS also enhances road safety by providing timely alerts, accident detection, and emergency response support. Furthermore, it promotes eco-friendly transportation by optimizing fuel consumption and reducing vehicle emissions.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
				Theory Marks		Practical Marks		CA	
CI	T	P	C	ESE	MSE	V	P	ALA	
4	0	2	5	60	30	10	20	30	150

Legends: CI-Classroom Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.

Course Content:

Sr. No.	Course Content	Hrs.	% Weightage
1	**Introduction of ITS** Overview ITS, components of ITS- sensors, communication networks, control systems, traffic management and optimization techniques, smart mobility solutions connected vehicle and autonomous transportation, real-time data analytics for traffic monitoring and prediction, vehicle and localization and navigation, multi-modal transportation planning, successful ITS deployments in urban environments, regulatory and policy consideration and ITS implementation.	10	20%

GYANMANJARI INNOVATIVE UNIVERSITY BHAVNAGAR

2	**ITS Architecture and Hardware** Architecture, ITS Architecture Framework, Hardware Sensors, Vehicle Detection, Techniques, Dynamic Message Sign, GPRS, GPS, Toll Collection ITS and strategic regional transportation planning; Integrating infrastructure and operations planning.	10	15%
3	**Advanced Transport Management System** Video Detection, Virtual Loop, Cameras, ANPR, IR Lighting, Integrated Traffic Management, Control Centre, Junction Management Strategies, ATMS, Advanced Traveler Information Systems (ATIS), Route Guidance, Issues, Historical, Current, Predictive Guidance, Data Collection, Analysis, Dynamic Traffic Assignment (DTA), Components, Algorithm. ITS and Technology, including automated highway systems (AHS); sensors, electronic toll collection (ETC); dedicated short range communication, and standards.	20	25%
4	**Advanced Travelers and Information System** Travel Information, Pre-Trip and Enroute Methods, Basic ATIS Concepts, Smart Route System, Data Collection, Process, Dissemination to Travelers, Evaluation of Information, Value of Information, Business Opportunities.	10	20%
5	**Case Studies on ITS** 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, application in bus transport, metro and highways; Emerging Issues.	10	20 %

Continuous Assessment:

Sr. No.	Active Learning Activities	Marks
1	**Understanding ITS Components** Students working in groups shall study and identify key components of Intelligent Transportation Systems (ITS). Each group will visit a nearby traffic junction to observe and document ITS elements such as signals, sensors, surveillance systems, and information displays. Based on their observations, students will prepare a model supported with photographs clearly identifying the ITS components. The final work in Group photo with model uploaded on the GMIU web portal.	10
2	**Dynamic Message Sign (DMS) Study** Individual students shall visit a city road where Dynamic Message Sign (DMS) displays are installed and study the type of messages shown along with their purpose. Students will observe traffic conditions, message relevance, and effectiveness in guiding road users. Based on the visit, each student must prepare a detailed field observation report in a structured format. The completed report shall be uploaded on the GMIU web portal.	10

3	**Automated Highway System (AHS) Research** Each student shall prepare and deliver a presentation covering the Automated Highway System (AHS) concept, the role of sensors and automation, as well as its benefits and challenges. Faculty will assign specific subtopics to individual students to ensure comprehensive and balanced coverage of the subject. Students are also required to prepare the presentation in a structured format. After completion, the presentation must be uploaded on the GMIU web portal.	10
TOTAL		**30**

Suggested Specification table with Marks (Theory): 60

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage %	30%	30%	20%	10%	-	10%

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcome:

After learning the course, the students should be able to:	
CO1	Understand the fundamentals and components of Intelligent Transportation Systems (ITS).
CO2	Explain ITS architecture, hardware components, and their applications.
CO3	Analyze advanced traffic management systems and related technologies.
CO4	Understand traveler information systems and their role in transportation.
CO5	Evaluate ITS case studies and their implementation in real-world scenarios.

List of Practical

Sr. No.	Descriptions	Unit No.	Hrs.
01	Study of ITS Components at a Traffic Intersection	01	02
02	Analysis of Smart Mobility Solutions and Connected Vehicle Systems	01	04
03	Study of ITS Architecture and Framework using Case Examples	02	02
04	Field Visit to Observe Hardware Components.	02	04
05	Traffic Data Collection and Analysis using Video Detection Techniques	03	02
06	Study of Junction Management and Traffic Control Strategies	03	04
07	Study of Advanced Traveler Information Systems (ATIS)	04	04
08	Analysis of Pre-Trip and Enroute Travel Information Systems	04	02
09	Case Study on Automated Highway Systems (AHS)	05	02

10	Comparative Study of ITS Implementation in Developed and Developing Countries	05	04
TOTAL			**30**

Instructional Method:

The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.
From the content 10% topics are suggested for flipped mode instruction.
Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory.
The internal evaluation will be done on the basis of Active Learning Assignment.
Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in the laboratory.

Reference Books:

[1] Intelligent Transport Systems, Intelligent Transportation Primer – Washington, US, 2001.
[2] Data Base System Concepts – Henry F. Korth and Abraham Silberschatz, McGraw Hill, 1992.
[3] ITS Handbook 2000 – Kan Paul Chen and John Miles, World Road Association (PIARC), 2000.
[4] Intelligent Transportation Systems: New Principles and Architectures – S. Ghosh and T. S. Lee, CRC Press, 2000.
[5] Intelligent Transportation Systems: Theory and Practice – A. K. Tyagi and N. Sreenath, Springer Nature, Singapore.