LEVEL 5 HIGHER INTERNATIONAL DIPLOMA

IN

ELECTRIC VEHICLE ENGINEERING

CURRICULUM FOR ELECTRIC VEHICLE ENGINEERING

BASED ON CREDIT SYSTEM

PROGRAMME LEARNING OUTCOMES (PLO):

I. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

II. 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.

III. 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.

IV. 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 Manage Construction Projects for Planning, Analyzing, Costing, Scheduling, Predicting and complete within the stipulated period and fund.

V. 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

VI. 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.

VII. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development, Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

VIII. 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.

IX. 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

X. 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

PROGRAMME GUIDELINES	
PROGRAMME TITLE	**Level 5 Higher International Diploma in Electric Vehicle Engineering**
QUALIFICATION CODE	**701/2723/7**
LEVEL	**LEVEL – 5**
TOTAL CREDITS	**240**
TOTAL LEARNING HOURS	**2400 HOURS**
GUIDED LEARNING HOURS	**960 HOURS**

Total learning hour 2400 Hours

1 Credit = 10 hours of effort (10 hours of learning time which includes everything a learner has to do to achieve the outcomes in a qualification including the assessment procedures and practical's).

Guided Learning Hour for first year is 480 hours and second year is 480 hours.
Total Guided Learning Hours for Higher International Diploma in Electric Vehicle Engineering is 960 hours.

HID IN ELECTRIC VEHICLE ENGINEERING

COURSE STRUCTURE

YEAR	SEMESTER	UNIT SPECIFICATION	NO. OF. UNITS	UNIT CREDIT	CREDIT/YEAR
I	SEMESTER 1	Common unit	1	15	120
		Essential unit	2	30	
		Elective (or) Open unit	1	15	
	SEMESTER 2	Common unit	1	15	
		Essential unit	2	30	
		Elective (or) Open unit	1	15	
II	SEMESTER	Essential unit	2	30	
		Elective (or) Open unit	2	30	
	SEMESTER 4	Essential unit	2	30	
		Special Unit (Essential)*	1	30	
				TOTAL	**240**

FIRST YEAR	Common unit carries	15 credits
	Essential unit carries	15 credits
	Elective unit carries	15 credits
SECOND YEAR	Essential unit carries	15 credits
	Elective unit carries	15 credits
	Special unit (Essential)* carries	30 credits

LIST OF UNITS

S.No	Subject Code	Unit	Unit Specification	Credit
1	J/727/2021	Technical Drawings with Engineering Graphics	Common unit	15
2	J/727/2022	Workshop and General Safety	Common unit	15
3	J/727/2023	Mathematics for Engineering Applications	Essential unit	15
4	J/727/2024	Electric Vehicle Body Engineering	Essential unit	15
5	J/727/2025	Design of Transmission Elements and System	Essential unit	15
6	J/727/2026	Traction Drives and control	Essential unit	15
7	J/727/2027	Electrical vehicle Dynamics	Essential unit	15
8	J/727/2028	Electronics system Design for Electrical vehicle	Essential unit	
9	J/727/2029	Advance Battery Technology	Essential unit	15
10	J/727/2030	Environmental impact and Sustainability	Essential unit	15
11	J/727/2031	Electrical Vehicle System Simulation using Simulink	Essential unit	15
12	J/727/3011	Project	Special unit (Essential)*	30
Elective Units				
13	J/727/1011	Material Science Engineering and Applications	Elective Unit	15
14	J/727/1012	Manufacturing Technology.	Elective Unit	15
15	J/727/1013	Computer aided design and Analysis	Elective Unit	15
16	J/727/1014	HVAC System and its Effects	Elective Unit	15
17	J/727/1015	Solar Battery Charging System	Elective Unit	15
18	J/727/1016	Mechanical Vibration	Elective Unit	15

Semester : I
Year : 1
Credit : 60

UNIT CODE	UNIT	UNIT SPECIFICATION	CREDIT
J/727/2021	Technical Drawings with Engineering Graphics	Common unit	15
J/727/2023	Applied Mathematics for Engineering	Essential unit	15
J/727/2024	Electric Vehicle Body Engineering	Essential unit	15
J/727/1011	Material Science Engineering and Applications	Elective Unit	15

Semester : II
Year : 1
Credit : 60

UNIT CODE	UNIT	UNIT SPECIFICATION	CREDT
J/727/2022	Workshop and General Safety	Common unit	15
J/727/2025	Design of Transmission Elements and System	Essential unit	15
J/727/2026	Traction Drives and Control	Essential unit	15
J/727/1012	Manufacturing Technology.	Elective Unit	15

Semester : III
Year : 2
Credit : 60

UNIT CODE	UNIT	UNIT SPECIFICATION	CREDIT
J/727/2027	Electrical vehicle Dynamics	Essential unit	15
J/727/2028	Electronics system Design for Electrical vehicle	Essential unit	15
J/727/2029	Advance Battery Technology	Essential unit	15
J/727/1014	HVAC System and its Effects	Elective Unit	15

Semester : IV
Year : 2
Credit : 60

UNIT CODE	UNIT	UNIT SPECIFICATION	CREDIT
J/727/2030	Environmental impact and Sustainability	Essential unit	15
J/727/2031	Simulation of Transmission System	Essential unit	15
J/727/3011	Project	Special unit (Essential)*	30

UNIT CODE	:	J/727/2021
UNIT TITLE	:	Technical drawings with Engineering Graphics
CREDIT	:	15
SPECIFICATION	:	Common Unit

UNIT DESCRIPTION

This unit enables students to understand about the technical drawing and its importance. This unit teaches the students about the vital role of technical drawings in engineering documents and communication. This unit covers angle of projection, Multiview, section, detail drawing and symbol.

UNIT LEARNING OUTCOMES

ULO1 - Use appropriate tool to develop technical drawings

ULO2 - Ability to understand and interpret technical drawings.

ULO3 - Ability to provide required information in technical drawing according to process and operation.

MAPPING

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10
ULO1	M	M		M	M		M	M		M
ULO2	M			M		M		M		
ULO3		M			M		M		M	M

UNIT CODE : J/727/2022

UNIT TITLE : Workshop and General Safety

CREDIT : 15

SPECIFICATION : Common Unit

UNIT DESCRIPTION

This unit help to know about tools used for diverse application in engineering workshop. This unit helps to learn skill-oriented experience in manufacturing process and production technology. This unit teaches safety procedure and workshop safety in various workshop practice.

UNIT LEARNING OUTCOME

ULO1 – Ability to select appropriate tool and process for required application

ULO2 – Ability to understand basic operation in manufacturing and production

ULO3 - Ability to maintain safety procedure and use safety tools and equipment in engineering practice.

MAPPING

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10
ULO1	M	M			M	M		M	M	M
ULO2			M	M			M	M		
ULO3	M		M		M	M	M	M		M

UNIT CODE	:	J/727/2023
UNIT TITLE	:	Mathematics for Engineering Applications
CREDIT	:	15
SPECIFICATION	:	Essential Unit

UNIT DESCRIPTION

This course intends to provide an overview of analytical and numerical techniques to solve ordinary and partial differential equations, which we apply to solve many engineering problems of mechanical, civil electrical Engineering.

UNIT LEARNING OUTCOMES

ULO1- Determine the solution of second and higher order linear differential equation and apply knowledge of LDE to solve the problems in civil, mechanical and electrical engineering

ULO2- Classify, formulate and solve the first order and second order linear, non-linear partial differential equations and apply the knowledge of partial differential equations

ULO3- Able to find approximate solution of ordinary differential equations of first order and find the convergence and stability of the approximate solutions.

MAPPING

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10
ULO1	M	M		M	M		M	M		M
ULO2	M			M		M		M		
ULO3		M			M		M		M	M

UNIT CODE	:	J/727/2024
UNIT TITLE	:	Electric Vehicle Body Engineering
CREDIT	:	15
SPECIFICATION	:	Essential Unit

UNIT DESCRIPTION

The main objective of this course is to impart knowledge in the construction of vehicle, aerodynamic, concept, paneling of passenger car body trim. At the end of the course the student will be well versed in the design and construction of external body of the vehicles.

UNIT LEARNING OUTCOME

ULO1 - Understand the details of Car, Bus and Commercial vehicle body details.

ULO2 – Understand the concept of vehicle aerodynamics.

ULO3 – Ability to know about the materials used, vehicle maintenance and repair.

MAPPING

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10
ULO1	M	M		M	M		M	M	M	M
ULO2	M						M		M	
ULO3	M	M	M	M	M	M			M	

UNIT CODE	:	J/727/2025
UNIT TITLE	:	Design of Transmission Elements and System
CREDIT	:	15
SPECIFICATION	:	Essential Unit

UNIT DESCRIPTION

Introduce basic concepts of design process Impart design principles involved in evaluating the critical design parameters of machine elements to satisfy functional and strength requirements Familiarize standard codes and practices to select materials and geometric parameters.

UNIT LEARNING OUTCOMES

ULO1 - To understand and apply principles of gear design to flexible elements spur gears and Design of Helical and Bevel Gear.

ULO2 -To understand and apply principles of design of speed reduction.

ULO3 - Apply knowledge to the brake design and also can able to know about design standards.

MAPPING

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10
ULO1	M	M		M	M		M	M		M
ULO2	M			M		M		M		
ULO3		M			M		M		M	M

UNIT CODE : J/727/2026

UNIT TITLE : Traction Drives and control

CREDIT : 15

SPECIFICATION : Elective Unit

UNIT DESCRIPTION

Aim of this subject to various EV motors & their Characteristic Curves also study of various electronic devices and Elements of drives, EV motor drive topologies and their working principles, various sensors in EV, basics requirements of motors and controllers for EV and suitability of electric motor & their control.

UNIT LEARNING OUTCOMES

ULO1- Able to understand the construction and working principle of various motors used in electric vehicles also the Motor & Drive characteristics & parameters

ULO2- Able to know about various EV drive concepts and working mechanism can able to Analyze the requirements of EV motors.

ULO3- Evaluate the suitability of electric motor & their control for EV also Comprehend the Configurations and Performance of Electric vehicles, their drives and control

MAPPING

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10
ULO1	M	M		M	M		M	M		M
ULO2	M			M		M		M		
ULO3		M			M		M		M	M

UNIT CODE	:	J/727/2027
UNIT TITLE	:	Electrical vehicle Dynamics
CREDIT	:	15
SPECIFICATION	:	Essential Unit

UNIT DESCRIPTION

Understand the dynamics of vehicle ride under different riding condition. Present a problem oriented in depth knowledge of Vehicle Dynamics. address the underlying concepts and methods behind Vehicle Dynamics Calculate and refer the loads and forces associated to the vehicles. Analyses the behaviour of the vehicles under acceleration, ride and braking

UNIT LEARNING OUTCOMES

ULO1- Analyse the dynamics of vehicle under different riding condition., Analyse acceleration and braking performance in electric vehicle to understand the vehicle dynamics under these conditions
ULO2- Articulate Road loads and tyre dynamics in electric vehicles. 4. Interpret riding comfort & vibrations, cornering and roll over in electric vehicles to understand the vehicular dynamics.
ULO3- Infer on the suspension kinematics and controllable suspension elements used in electric vehicles.

MAPPING

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10
ULO1	M	M		M	M		M	M		M
ULO2	M			M		M		M		
ULO3		M			M		M		M	M

UNIT CODE : J/727/2028

UNIT TITLE : Electronics system Design for Electric vehicle

CREDIT : 15

SPECIFICATION : Essential Unit

UNIT DESCRIPTION

This unit enables the students to understand the basics of electronics system design related to electric vehicle also it deals with power supply, filter and regulator how to design the protection circuits and charging circuit design.

UNIT LEARNING OUTCOMES

ULO1- Understand the different design parameters and requirement of power supplies. Also elaborate about the design of filters and regulators

ULO2- Able to know elaborate about the design of inverter and driver circuits.

ULO3- Understand the protection circuits and the design of UPS system for application.

MAPPING

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10
ULO1	M	M		M	M		M	M		M
ULO2	M			M		M		M		
ULO3		M			M		M		M	M

UNIT CODE	:	J/727/2029
UNIT TITLE	:	Advance Battery Technology
CREDIT	:	15
SPECIFICATION	:	Essential Unit

UNIT DESCRIPTION

The objective of this course is to make the students to understand the working and characteristics of different types of batteries and their management.

UNIT LEARNING OUTCOMES

ULO1- Understand the chemistry, safe operating area, efficiency, aging. Characteristics SOC, DOD, SOH. Balancing-Passive Balancing Vs Active Balancing. Other Batteries-NCM and NCA Battery Pack-design, sizing, calculations, flow chart, real and simulation

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ULO2- Able to understand Battery Modelling Methods-Equivalent Circuit Models, Electrochemical Model, Neural Network Model SOC Estimation- Definition, importance, single cell Vs series batteries SOC. Estimation Methods Load voltage, Electromotive force, AC impedance, Ah counting

ULO3- Battery Management System- need, operation, classification Wireless BMS MCU. Communication Modules- CAN Open-Flex RayCANedge1 package. ARBIN Battery Tester

MAPPING

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10
ULO1	M	M		M	M		M	M		M
ULO2	M			M		M		M		
ULO3		M			M		M		M	M

UNIT CODE : J/727/2030

UNIT TITLE : Environmental impact and Sustainability

CREDIT : 15

SPECIFICATION : Essential Unit

UNIT DESCRIPTION

The aim of the course is to provide students with a comprehensive understanding of the environmental impact and sustainability aspects associated with electric vehicles (EVs). This includes examining the lifecycle analysis of EVs, assessing their carbon footprint, understanding the implications on resource consumption, and exploring strategies for enhancing sustainability within the electric vehicle ecosystem.

UNIT LEARNING OUTCOMES

ULO1- Understand the environmental implications of traditional internal combustion engine vehicles compared to electric vehicles. Analyze the lifecycle assessment of electric vehicles, including manufacturing, use, and disposal phases.

ULO2- Evaluate the carbon footprint of electric vehicles and identify strategies for reducing emissions throughout their lifecycle. Assess the environmental benefits and challenges associated with the adoption of electric vehicles on a global scale.

ULO3- Explore sustainable practices and technologies within the electric vehicle industry, such as battery recycling and renewable energy integration. Critically analyze policies and regulations aimed at promoting the sustainability of electric vehicles and their infrastructure.

MAPPING

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10
ULO1	M	M		M	M		M	M		M
ULO2	M			M		M		M		
ULO3		M			M		M		M	M

UNIT CODE : J/727/2031

UNIT TITLE : Electrical Vehicle System Simulation using Simulink

CREDIT : 15

SPECIFICATION : Essential Unit

UNIT DESCRIPTION

The aim of this course is to provide students with hands-on experience in simulating and analyzing electrical vehicle (EV) systems using Simulink, a powerful simulation tool widely used in industry and academia. Through practical exercises and projects, students will gain proficiency in modeling various components of EV systems, simulating their behavior under different operating conditions, and evaluating performance metrics to optimize system design and control strategies.

UNIT LEARNING OUTCOMES

ULO1- Proficiently use Simulink for modeling and simulating electrical vehicle components and subsystems**.**

ULO2- Analyze the dynamic behavior and performance characteristics of electrical vehicle systems under different driving conditions and load profiles.

ULO3- Interpret simulation results to identify potential improvements and design modifications for enhancing electrical vehicle system performance and sustainability.

MAPPING

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10
ULO1	M	M		M	M		M	M		M
ULO2	M			M		M		M		
ULO3		M			M		M		M	M

UNIT CODE : J/727/3011

UNIT TITLE : Project

CREDIT : 15

SPECIFICATION : Essential Unit

UNIT DESCRIPTION

The module aims to enable you to complete a substantial piece of individual work and build on your expertise in a selected area of study. It aims to develop your research, time management, presentation and written communication skills.

UNIT LEARNING OUTCOME

ULO1 - Identify a research question, problem or hypothesis and establish aims and objectives to support the investigation.

ULO2 - Communicate the planned project work using standard methods and tools.

ULO3 - Develop a research and data collection strategy appropriate to the research question / problem posed.

ULO4 – Critically evaluate the research findings using reasoned and logical arguments within a structured written framework.

MAPPING

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10
ULO1	M	M	M	M			M	M	M	M
ULO2		M				M			M	
ULO3	M		M	M	M		M	M		M
ULO4	M		M			M		M	M	M

UNIT CODE : J/727/1011

UNIT TITLE : Material Science Engineering and Applications

CREDIT : 15

SPECIFICATION : Elective Unit

UNIT DESCRIPTION

In this course you will have the opportunity to learn something about the fundamentals of the structure/ property's relationships of all types of materials (ceramics, metals and their alloys, polymers and composites thereof).

UNIT LEARNING OUTCOMES

ULO1- Ability to know about phase diagram and the alloy of the ferrous its applications.

ULO2-Ability to know about various properties like mechanical, magnetic, electric and super conducting materials.

ULO3 – Ability to understand about advance materials, its properties and applications

MAPPING

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10
ULO1	M	M		M	M		M	M		M
ULO2	M			M		M		M		
ULO3		M			M		M		M	M

UNIT CODE : J/727/1012

UNIT TITLE : Manufacturing Technology.

CREDIT : 15

SPECIFICATION : Elective Unit

UNIT DESCRIPTION

To give an exposure to different techniques of casting and molds required, rolling processes and different rolled products to familiarize with different forging methods, cautions to be adopted in die design. To give an introduction to various work and tool holding devices used in manufacturing, bending, shearing and drawing processes of sheet metal working and allied machines. Also, an understanding of welding metallurgy and weldability and to introduce various metal joining techniques.

UNIT LEARNING OUTCOMES

ULO1- Acquire knowledge in various casting processes and technology related to them. rolling passes required for getting required shapes of rolled products.

ULO2- Discuss important aspects of forging techniques, discuss sheet metal working processes and their applications to produce various shapes and products.

ULO3- Acquire knowledge in various types of welding processes, its defect and its applications.

MAPPING

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10
ULO1	M	M		M	M		M	M		M
ULO2	M			M		M		M		
ULO3		M			M		M		M	M

UNIT CODE	:	J/727/1013
UNIT TITLE	:	Computer Aided Design and Analysis
CREDIT	:	15
SPECIFICATION	:	Elective Unit

UNIT DESCRIPTION

Focus on engineering modeling in 3D and technical drawing in 2D using advanced CAD tools. Hands-on course work will allow students to ideate and model mechanisms. Course will focus on design tools for subsequent classes and industrial best practices. Topics will include ideation, design of machine components, and introduction to design for prototyping, machining, manufacture, assembly and repair

UNIT LEARNING OUTCOMES

ULO1- Convey ideas through sketches and other graphical means, create and analyze solutions to design problems in accordance to professional standards

ULO2- Create two dimensional drawings incorporating basic conventions of geometric dimensioning and tolerancing of components using CAD, create three dimensional models of components and mechanisms using CAD.

ULO3- Conduct a various analysis of a components and understand CAD practices that facilitate iteration and change.

MAPPING

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10
ULO1	M	M		M	M		M	M		M
ULO2	M			M		M		M		
ULO3		M			M		M		M	M

UNIT CODE : J/727/1014

UNIT TITLE : HVAC System and its Effects in Electric Vehicle.

CREDIT : 15

SPECIFICATION : Elective Unit

UNIT DESCRIPTION

This course aims to provide students with a comprehensive understanding of Heating, Ventilation, and Air Conditioning (HVAC) systems in electric vehicles, focusing on their design, operation, and impact on vehicle performance and efficiency performance.

UNIT LEARNING OUTCOMES

ULO1- Explore the basic principles of heating, ventilation, and air conditioning. Learn about the components of HVAC systems and their functions in electric vehicles. Analyze the differences between conventional HVAC systems and those designed for electric vehicles.

ULO2- Examine the integration of HVAC systems within the architecture of electric vehicles. Understand the challenges and opportunities in optimizing HVAC systems for electric vehicles. Explore strategies for enhancing energy efficiency while maintaining passenger comfort and safety.

ULO3- Investigate the effects of HVAC systems on electric vehicle range and battery life. analyze the trade-offs between HVAC performance and overall vehicle efficiency. Explore emerging technologies and innovations aimed at improving HVAC efficiency and performance in electric vehicles.

MAPPING

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10
ULO1	M	M		M	M		M	M		M
ULO2	M			M		M		M		
ULO3		M			M		M		M	M

UNIT CODE : J/727/1015

UNIT TITLE : Solar Battery Charging System

CREDIT : 15

SPECIFICATION : Elective Unit

UNIT DESCRIPTION

Understand the functioning of solar photovoltaic cells and the ratings, the solar array connection and estimate solar module power. understand function of charge controller and MPPT techniques the concept of solar PV system design and integration explain the installation, trouble shooting and safety requirement of solar system

UNIT LEARNING OUTCOMES

ULO1- Able to know the functioning of solar photovoltaic cells and cell parameters and design the solar array connections and hence solar module for a given application.

ULO2- Able to analyze the function of charge controller and need for MPPT techniques. Also know about off grid solar photo voltaic system.

ULO3- understand how to do the installation, trouble shooting and safety requirement of solar system.

MAPPING

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10
ULO1	M	M		M	M		M	M		M
ULO2	M			M		M		M		
ULO3		M			M		M		M	M

UNIT CODE : J/727/1016

UNIT TITLE : Mechanical Vibration

CREDIT : 15

SPECIFICATION : Elective Unit

UNIT DESCRIPTION

The course will cover fundamental concepts on the vibration of mechanical systems including, but not limited to, review of systems with one degree for freedom, Lagrange's equations of motion for multiple degree of freedom systems, introduction to matrix methods, transfer functions for harmonic response, impulse response, and step response, convolution integrals for response to arbitrary inputs, principle frequencies and modes, applications to critical speeds, measuring instruments, isolation, torsional systems, introduction to nonlinear problems

UNIT LEARNING OUTCOMES

ULO1- Able to know the type of vibrations, simple hormonic also understand about undamped and damped vibrations.

ULO2- Able to understand the function of forced vibrations, Vibration Measuring Instruments and Whirling of shafts: Seismic Instruments.

ULO3- Understand Systems with two degrees of Freedom, Numerical Methods for multi degree freedom of systems.

MAPPING

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10
ULO1	M	M		M	M		M	M		M
ULO2	M			M		M		M		
ULO3		M			M		M		M	M

ASSESSMENT METHODS AND TECHNIQUES FOR HID IN ELECTRIC VEHICLE ENGINEERING

Assessment technique	Type of Assessment	Description	Formative or Summative

Case studies	Oral/ Problem based/ Practical	Students are required to work through a case study to identify the problem(s) and to offer potential solutions; useful for assessing students' understanding and for encouraging students to see links between theory and practice. Case studies could be provided in advance of a time-constrained assessment.	**Formative**
Concept maps	Written/ Oral	Students map out their understanding of a particular concept. This is a useful (and potentially quick) exercise to provide feedback to staff on students' understanding.	**Formative**
'Doing it' exam	Written	An exam which requires students to do something, like read an article, analyze and interpret data etc.	**Formative / Summative**
Field report	Written/ Oral	Students are required to produce a written/ oral report relating to a field/ site visit.	**Formative**
Laboratory books / Reports	Practical/ Written	Students are required to write a report for all (or a designated sample) of practical's in a single lab book. A sample of lab books will be collected each week to mark any reports of labs done in previous weeks; this encourages students to keep their lab books up to date. Each student should be sampled the same number of times throughout the module with a designated number contributing to the assessment mark.	**Summative**
Multiple choice questions (MCQs)	Written	Can be useful for diagnostic, formative assessment, in addition to summative assessment. Well-designed questions can assess more than factual recall of information, but do take time to design.	**Formative / Summative**
Online discussion boards	Written	Students are assessed on the basis of their contributions to an online discussion for example, with their peers; this could be hosted on a virtual learning environment (VLE).	**Formative**
Open book exams	Written	Students have the opportunity to use any or specified resources to help them answer set questions under time constraints. This method removes the over-reliance on memory and recall and models the way that professionals manage information.	**Summative**
Oral presentations	Oral / Written	Students are asked to give an oral presentation on a particular topic for a specified length of time and could also be asked to prepare associated	**Summative**

		handout(s). Can usefully be combined with self- and peer-assessment.	
Problem sheets	Written	Students complete problem sheets, e.g. on a weekly basis. This can be a useful way of providing students with regular formative feedback on their work and/or involving elements of self- and peer assessment.	**Formative**
Research projects / Group projects	Written/ Practical/ Oral/ Performance/ Problem based/ Work placement	Potential for sampling wide range of practical, analytical and interpretative skills. Can assess wide application of knowledge, understanding and skills.	**Formative / Summative**
Short answer questions	Written	Useful to assess a wide range of knowledge/skills across a module.	**Summative**
Simulations	Practical/ Written/ Oral/ Problem-based	Text or virtual computer-based simulations are provided for students, who are then required to answer questions, resolve problems, perform tasks and take actions etc. according to changing circumstances within the simulation. Useful for assessing a wide range of skills, knowledge and competencies.	**Formative**
Viva voce	Oral	Often used for assessing 'borderline' degree classifications but also useful to explore students' understanding of a wide range of topics. Depending on class size however, they can be time consuming for staff.	**Summative**