Final

DIPLOMA CURRICULUM OF CHEMICAL ENGINEERING (SECOND YEAR) (4th Semester)

(To be implemented from 2025-26)

Prepared by;

National Institute of Technical Teachers' Training & Research Kolkata
Block – FC, Sector – III, Salt Lake City, Kolkata – 700106

Vetted by:
Domain experts from Polytechnics of Odisha

State Council for Technical Education & Vocational Training
Near Raj Bhawan, Unit-VIII, Bhubaneswar, Odisha

Table of Contents

SEMESTER – IV

SL. No	Category of Course	Code No	Course Title	Teaching Scheme				Evaluation Scheme				Total Marks	Credits
				Pre-requisite	Contact Hours/ week			Theory		Practical			
					L	T	P	End Exam	Progressive Assessment	End Exam	Progressive Assessment		
1	Programme core	CHEPC202 TH:1	Process Heat Transfer		3	0	0	70	30	-	-	100	3
2		CHEPC204 TH:2	Engineering Thermodynamics		3	0	0	70	30	-	-	100	3
3		CHEPC206 TH:3	Mass Transfer - I		3	0	0	70	30	-		100	3
4		CHEPC208 PR:1	Heat Transfer Lab		0	0	4	-	-	15	35	50	2
5		CHEPC210 PR:2	Mass Transfer - I Lab		0	0	4	-	-	15	35	50	2
6	Programme elective	CHEPE202 TH:4	Plant Utilities		3	0	0	70	30	-	-	100	3
7		CHEPE204 TH:5	Plant Safety Management		3	0	0	70	30	-	-	100	3
8		CHEPE206 PR:3	Plant Safety Management Lab		0	0	4	-	-	15	35	50	2
9	Minor Project	PR202 PR:4	MINOR PROJECT		0	0	4	-	-	30	70	100	2
	Mandatory	AU202	Essence of Indian knowledge and tradition		2	0	0	0	0	-	-	0	0
TOTAL					**17**	**0**	**16**	**350**	**150**	**75**	**175**	**750**	**23**

CONTENT DETAILS OF SEMESTER - IV

TH:1- PROCESS HEAT TRANSFER

L	T	P	Total Marks: 100	Course Code: CHEPC202	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 45Hrs		End Term Exam	70
				Progressive Assessment	: 30
Pre Requisite		**: Nil**			
Credit		**3**		Category of Course : PC	

RATIONALE:

Diploma Engineers working at chemical and allied industries are responsible for supervising production processes to achieve production targets and for optimal utilization of resources. In process industries there are many operations which involve transfer of energy in the form of heat. Also, the various chemical reactions involved take place with the evolution or absorption of heat. In all these cases, the major problem is that of transfer of heat at the desired rate. For this purpose, a knowledge of laws of heat transfer, mechanisms of heat transfer and process heat transfer equipment is required to be imparted. The students are to be trained and equipped with adequate theoretical and practical knowledge about heat transfer and various heat exchange equipment like double pipe heat exchanger, shell and tube heat exchanger, finned tube heat exchanger etc. Hence, this course is introduced to provide hands on experience on various heat transfer equipment used in the manufacturing stream and to provide foundation for diploma chemical engineers who want to further specialize in the field of chemical technology.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Explain different modes of heat transfer.
- State empirical laws and equations for estimating rate of heat transfer.
- Describe insight on different heat transfer equipment.

COURSE CONTENT DETAILS:

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
I	**Introduction to Heat Transfer:** Concept of Heat; Importance of Heat Transfer Operations; Basic modes of Heat Transfer (Conduction, Convection and Radiation); Steady state and Unsteady state heat transfer	**3**
II	**Conduction:** Fourier's Law of heat conduction; Thermal Conductivity of materials; Steady state heat conduction through plane single wall & composite wall, cylinder; Thermal Insulation and insulating materials; Concept of critical thickness of insulation; Practical applications of fins; Simple numerical problems on heat conduction	**10**

III	**Convection**: Nature of heat transfer by Convection; Natural Convection vs. Forced Convection; Concept of Individual and Overall Heat Transfer Coefficient; Dimensionless Numbers and their significance: Reynolds No., Nusselt No., Prandtl No., Grashoff No.; Simple numerical problems using Dittus-Boelter equation and convective heat transfer coefficient	**6**
IV	**Radiation**: Nature of Thermal Radiation; Surface Emission properties: Total Emissive Power, Monochromatic Emissive Power, Emissivity;Absorptivity,Reflectivity and Transmissivity; Concept of Black Body; White Body, Opaque Body, Gray Body; Laws of Radiation: Stefan-Boltzmann Law, Kirchoff‟s Law, Planck‟s Law, Wien‟s Displacement Law	**8**
V	**Heat Transfer in Fluids with phase change**: Definition of Boiling and Condensation; Boiling Regimes: Interface Evaporation, Nucleate Boiling and Film Boiling; Condensation: Film Condensation and Dropwise Condensation	**3**
VI	**Heat Exchangers**: Difference between Sensible heat and Latent heat; Relative direction of fluid motion and their applications: Parallel Flow, Counter-current Flow and Cross flow; Types of Heat Exchanger (Construction, Working, Application): Double Pipe Heat Exchanger, and Shell & Tube Heat Exchanger; Passes in Shell-side and Tube-side; Guidelines for directing the fluids in Shell and Tubes; Applications of Extended Surface Exchanger and Plate-Type Heat Exchanger; Concept of LMTD, Overall Heat Transfer Coefficient, Correction factor, Fouling/scaling; Simple calculation of overall heat transfer coefficient in heat exchangers & heat transfer area.; Definitions of cooler, chiller, reboiler, condenser	**11**
VII	**Evaporation**: Difference between Evaporation and Boiling; Objective of Evaporation; Performance of Evaporator: Capacity and Economy; Boiling Point Elevation; Feeding mechanism in a Multiple Effect Evaporator: Forward Feed, Backward Feed and Fixed Feed; Single Effect Evaporator vs. Multiple Effect Evaporator	**4**
	Total	**45**

REFERENCES:

1.	DC. Sikdar, “Process Heat Transfer and Chemical Equipment Design”, Revised Ed., Khanna Publishing House
2.	W. L. McCabe and J. C. Smith, “Unit Operations in Chemical Engineering”, 7th Edition McGraw Hill Publishing Co.
3.	Binay K. Dutta, “Heat Transfer Principles and applications” Prentice Hall of India Pvt. Ltd.

TH:2- ENGINEERING THERMODYNAMICS

L	T	P		
3	0	0		**Course Code: CHEPC204**
Total Contact Hours				**Theory Assessment**
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam 70
				Progressive Assessment : 30
Pre Requisite		**: Nil**		
Credit		**3**		Category of Course : PC

RATIONALE:

Thermodynamics, as the name indicates, is concerned with the flow of heat and it deals with energy charges accompanying all types‟ physical and chemical processes. The principle of engineering thermodynamics will help in process design and analysis for arriving at optimum economic results. Therefore, knowledge of laws of thermodynamics is necessary for the success of chemical engineers.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Explain the basic concepts and terminologies used in thermodynamics.
- State and analyse different thermodynamic laws and its applications..
- Illustrate different properties of pure fluids.
- Correlate an insight into thermodynamic property relations and solution thermodynamics

.

COURSE CONTENT DETAILS:

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
I	**Introduction and Basic Concepts:** Concept of system, surrounding and boundary; Types of Systems: Closed system, Open system and Isolated system; Extensive property and Intensive property; State function and Path function; Thermodynamic equilibrium(Thermal, Mechanical and Chemical); Quasi-static process; Reversible process; Concept of work and heat in thermodynamics; Zeroth Law of Thermodynamics	**9**
II	**First Law of Thermodynamics**: Statement of 1st law of Thermodynamics; Internal energy;Enthalpy;1st law of thermodynamics applied to closed and open systems; Reversible work; Applications of 1st law of thermodynamics in a closed system for an ideal gas: Isochoric process, isobaric process, isothermal process, adiabatic process and polytrophic process; Relation between Specific heat of constant pressure and constant volume; Limitations of 1st law of thermodynamics; Solve simple numerical	**15**

III	**Second Law of Thermodynamics**: Concept of Thermal reservoir (Source and Sink); Heat Engine and Heat Pump/Refrigerator; Kelvin-Planck and Clausius statements; Carnot cycle and Carnot Engine; Clausius inequality; Concept of Entropy and change of entropy for various conditions; Statement of 3rd law of Thermodynamics	**8**
IV	**Volumetric Properties of Pure fluids**: P-V-T behavior of pure substances; Equation of state and ideal gas; Virial Gas equation of state and Compressibility factor (Only conditions and mathematical expression)	**6**
V	**Thermodynamic Property Relations of Pure Substances and Introduction to Solution Thermodynamics**: Classification of thermodynamics properties; Work function and Gibb‟s energy; Maxwell Relations; Concept of Residual property and Excess property; Concept of Fugacity and Activity and its significance	**7**
	Total	**45**

REFERENCES:

1.	J. M. Smith, H. C. Van Ness, M. M. Abbott “Chemical Engineering Thermodynamics”, Tata McGraw Hill
2.	K. V. Narayanan, “A Textbook of Chemical Engineering Thermodynamics”, PHI
3.	Y. V. C. Rao, “An Introduction to Thermodynamics”, University Press

TH:3- MASS TRANSFER – I

L	T	P		
3	0	0		**Course Code: CHEPC206**
Total Contact Hours				**Theory Assessment**
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam 70
				Progressive Assessment : 30
Pre Requisite		**: Nil**		
Credit		**3**		Category of Course : PC

RATIONALE:

There are many operations in chemical engineering practices involve transfer of mass of a material from one phase (e.g. liquid) to the other phase (e.g. gaseous) associated with or without chemical reactions. Mass transfer operations such as distillation, absorption, and adsorption are often found to constitute the most important amongst the unit operation comprising in a particular process industry. Therefore, it is very important for a chemical engineer to have an idea on the fundamental principles underlying various mass-transfer operations as also understand the working principles and construction of many types of equipment effecting mass transfer in industrial situation.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Apply Fundamentals of mass transfer operations, principles of diffusion, mass transfer coefficients
- Apply the concept and operation of various types of gas-liquid contacts equipment"s for absorption and adsorption.
- Explain the principles used in different mass transfer operation
- Describe the working principle and maintenance of various equipment used in different mass transfer operations like distillation, absorption and adsorption

COURSE CONTENT DETAILS:

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
I	**Fundamentals of Mass Transfer:** Importance of mass transfer operations; General principle of mass transfer operations; Classification of mass transfer operations; Mechanism: Molecular and Convective mass transfer; Effect of temperature and pressure on diffusion; Fick's Law; Diffusion in binary gas and liquid mixture and solve simple numerical; Concept of mass transfer coefficient and inter phase mass transfer	**12**
II	**Distillation:** Relative Volatility; Concept of Vapor-Liquid Equilibrium; Flash Distillation and its material balance; Simple	**20**

	Distillation and derivation of Rayleigh's equation; Basic design, components and working of a distillation column for a binary mixture, Feed line conditions, Type of trays(Bubble-Cap, Sieve and Valve trays), Operational features in a tray column (Flooding, Foaming, Weeping, Dumping, Entrainment), McCabe-Thiele method, Reflux ratio and its different types, Plate efficiency and Murphree efficiency; Steam distillation and its applications; Azeotropic distillation and Extractive distillation	
III	**Absorption:** Principles of absorption and factors affecting rates of absorption; Properties of solvent used in absorption; Different equipment used for absorption(Mechanically agitated vessel and Packed Tower; Characteristics of tower packing and packing materials; Types of tower packing: Structured and Random packing; Comparison between plate tower and packed tower; Applications of Gas Absorption and Stripping; Concept of HETP	**8**
IV	**Adsorption:** The principles of adsorption and types of adsorption and factors affecting adsorption; The different types of adsorbents and nature of adsorbents; Selection of adsorbent; Elutriation, percolation and industrial application of adsorption	**5**
	Total	**45**

REFERENCES:

1.	Binay. K. Dutta "Principles of Mass Transfer and Separation Processes"., PHI Learning
2.	R.E. Treybal, "Mass Transfer Operations", McGraw Hill Book Co., New York.
3.	J. M. Coulson and J. F. Richardson, "Chemical Engineering", Vol. II, Butterworth Heinemann, New York.
4.	W.L. McCabe, J.C. Smith and P. Harriot, "Unit Operations of Chemical Engineering", McGraw Hill Book Co., New York.
5.	K. A. Gavhane, Unit Operation II, Nirali Publication

PR:1- HEAT TRANSFER LAB

L	T	P		
0	0	4		**Course Code: CHEPC208**
Total Contact Hours				**Practical Assessment**
Practical		: 30Hrs	**Total Marks: 50**	End Term Exam 15
				Progressive Assessment : 35
Pre Requisite		**: Nil**		
Credit		**2**		Category of Course : PC

RATIONALE:

Heat transfer in process industry is an important unit operation. The practices on heat transfer experiments will help the students to understand basic principles of modes of heat transfer and acquaint the students about the construction and operation of various heat transfer equipment.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Explain how heat transfer occurs for different equipment and worked out the parameters studied in theory.

LIST OF EXPERIMENTS:

Sl. No.	Name of Experiments
1	Demonstrate the heat transfer through composite wall.
2	Demonstrate the heat transfer through forced convection.
3	Demonstrate the operation through Stefan-Boltzmann apparatus
4	Demonstrate the operation of Shell and Tube Heat Exchanger
5	Demonstrate the operation of Double Pipe Heat Exchanger

REFERENCES:

1.	Lab Manual
2.	W. L. McCabe, J. C. Smith and P. Harriott, "Unit operations of Chemical Engineering", McGraw Hill, International Edition.
3.	G Chandrasekhar, Laboratory Experiments in Chemical and Allied Engineering, Penram International publishing (India) Pvt. Ltd.

PR:2- MASS TRANFER – I LAB

L	T	P		
0	0	4		**Course Code: CHEPC210**
Total Contact Hours				**Practical Assessment**
Practical		: 60Hrs	**Total Marks: 50**	End Term Exam 15
				Progressive Assessment : 35
Pre Requisite		**: Nil**		
Credit		**2**		Category of Course : PC

RATIONALE:

Mass transfer is the net movement of mass from one location, usually meaning stream, phase, fraction or component, to another. Mass transfer occurs in many processes, such as wetted wall column, absorption, and distillation. Mass Transfer is the basic subject of Chemical Engineering. Mass Transfer tells us the mechanisms and concentrations between different phases. All the basic operations in industries is based upon mass transfer. Simple laboratory based mass transfer operation are designed for better understanding of the concept of mass transfer

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Describe the concept of distillation, absorption and adsorption
- Demonstrate the operation of various mass transfer equipment.
- Examine the correlation of different parameters in mass transfer.
- Construct and operate of various mass transfer equipment

LIST OF EXPERIMENTS:

Sl. No.	Name of Experiments
1	Operation of Wetted Wall Column
2	Demonstrate the operation of a fractional distillation unit
3	Demonstrate operation of the differential distillation equipment.
4	Identify different components and operate the bubble cap rectification column.
5	Demonstrate the operation of a steam distillation unit
6	Demonstrate and operation of a packed bed absorption tower

REFERENCES:

1.	Lab Manual

TH:4- PLANT UTILITIES

L	T	P		
3	0	0		**Course Code: CHEPE202**
Total Contact Hours				**Theory Assessment**
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam 70
				Progressive Assessment : 30
Pre Requisite		**: Nil**		
Credit		**3**		Category of Course : PE

RATIONALE:

Utilities are the lifeblood of industrial plants, providing the essential services and support necessary to keep operations running smoothly. From power supply to waste management, these technical utilities form the backbone of production, efficiency, and safety, enabling industries to thrive and innovate.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- State the importance of health, safety and the environment in process industries.
- Assess the importance of steam, power, water, air and fuel and its efficient utilization in process industry.
- Explain the basic refrigeration and liquefaction principles.

COURSE CONTENT DETAILS:

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
I	**Water as Basic Utility**: Sources and storage of water in industry; Quality parameters like Hardness (Hard & Soft water), Turbidity, Suspended solids, Alkalinity, etc; Requisites of Industrial Water and its uses; Methods of water treatment: Screening, Coagulation, Sedimentation, Filtration, Sterilisation, Softening(Lime Soda process, Reverse osmosis, Zeolite), Demineralisation (Ion Exchange Process); Water for boiler use	**12**
II	**Steam, Steam generation and Boiler**: Properties of Steam (Enthalpy, Wet steam, Saturated steam, Superheated steam, Specific volume of steam), Types of steam (HP steam, MP steam, LP steam); Steam distribution and condensate utilization; Components and accessories associated with a boiler; Comparison between Water Tube Boiler and Fire Tube Boiler; Boiler operation troubleshooting	**11**
III	**Refrigeration:** Working principle of refrigeration; Refrigeration Cycle components: Compressor, Condenser, Expansion device and Evaporator; Different types of Refrigerants (Primary and	**7**

	Secondary); Selection of refrigerants	
IV	**Air**: Utility air (Compressed air, Blower air, Fan air, Instrumental air); Classification of different types of compressors and its applications; Importance of vacuum pump; Properties and uses of inert gases in industry; Drying unit and regeneration of drying unit	**8**
V	**Fuel and Waste Disposal**: Types of Fuel used in Chemical Process Industries for Power Generation such as Natural Gas, Liquid Petroleum Fuels, Coal and Coke. Internal Combustion Engine, Petrol and Diesel Engine; Waste Disposal.	**7**
	Total	**45**

REFERENCES:

1.	P. L. Ballaney, "Thermal Engineering", Khanna Publisher New Delhi.
2.	Perry R. H. Green D. W. "Perry"s chemical Engineer"s Handbook", McGraw Hill, New York,.
3.	D B DHONE, "Plant utilities" Nirali Prakashan.
4.	P. N. Ananthanarayan, "Basic Refrigeration & Air-Conditioning", Tata McGraw Hill, New Delhi.
5.	Sadhu Singh, Refrigeration & Air-Conditioning, Khanna Publishing House. New Delhi

TH:5- PLANT SAFETY MANAGEMENT

L	T	P		
3	0	0		**Course Code: CHEPE204**
Total Contact Hours				**Theory Assessment**
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam 70
				Progressive Assessment : 30
Pre Requisite		**: Nil**		
Credit		**3**		Category of Course : PE

RATIONALE:

Plant Safety Management in the Chemical Engineering curriculum is essential for preparing students to effectively identify, assess, and mitigate hazards within chemical processing environments. This subject equips future chemical engineers with the knowledge and skills necessary to ensure the safety of personnel, protect the environment, and maintain the integrity of industrial operations.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Define safety management
- State Safe working practice
- List the name of Personal Protective Equipment and their application
- State Fire Prevention & can do Fire Fighting.
- Describe Chemical Hazards, Mechanical Hazards, Electrical Safety, Electrical Shocks

COURSE CONTENT DETAILS:

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
I	**INTRODUCTION TO INDUSTRIAL SAFETY MANAGEMENT**: Fundamentals of Risk, Danger, Hazard, Accident, Unsafe act and Unsafe condition, Safety; Classification of Accidents; Principles and Objectives of Safety Management.	**4**
II	**SAFE WORKING PRACTICE:** Good Housekeeping practices; Benefits of Work Place Safety; Different ways to create Safe Working Environment; Safety instructions during maintenance; Permit to work system; Benefits of Safety Interlocks and examples; Safety in handling and storage	**9**
III	**FIRE PREVENTION AND FIRE FIGHTING:** Fire Triangle; Need of Fire Management and Fire Control; Classification of Fire; Different types of fire extinguisher and their application; Fire extinguishing Technique; Causes of industrial fire and prevention; Precautions for prevention of fire.	**6**

IV	**PERSONAL PROTECTIVE EQUIPMENT (PPE)**: Requirement of personal protective equipment; Classification of Hazards; Applications of PPE for different parts of body.	**4**
V	**CHEMICAL HAZARDS, ITS PREVENTION AND SAFETY MEASURES:** Classification of Chemical Hazards; Factors influencing effects of toxic chemicals; Terms related to concentration level as per industrial hygiene norm: Maximum Allowable Concentration, Ceiling Value, Threshold Limit, Short Term Exposure Limit; Toxic chemical and their harmful effects on human body; Control measure for Chemical hazards; Guidelines for storage of Ammonia, Chlorine and LPG; Safety colour code of chemicals	**7**
VI	**MECHANICAL AND ELECTRICAL SAFETY:** Sources of Mechanical hazards; Requirement of machine guards; Causes of failure of pressure vessels and hazards related to it; Types of maintenance (Breakdown, Preventive and Condition-based); Electrical hazards in industrial system and safety provisions to prevent them	**5**
VII	**INDUSTRIAL SAFETY MANAGEMENT:** Salient features of Factory Act 1948; OHSAS 18001; Features of ISO 9001, ISO 14001, and ISO 45001; Integration of Safety, Health and Environment; 5S Principles; Kaizen; Quality Management System (QMS); Material Safety Data Sheet (MSDS); Job Safety Analysis; HAZOP Analysis; Hazard Identification and Risk Assessment (HIRA); Emergency Response Plan;	**10**
	Total	**45**

REFERENCES:

1.	R.K. Jain, Sunil Rao, Industrial safety Health and Environment System, Khanna Publication
2.	Tarafdar & Tarafdar, Industrial Safety Management, Dhanpat Ray & Sons
3.	Amit Gupta, Industrial, safety and Environment, Laxmi Publication

PR:3- PLANT SAFETY MANAGEMENT LAB

L	T	P		
0	0	4		**Course Code: CHEPE206**
Total Contact Hours				**Practical Assessment**
Practical		: 60Hrs	**Total Marks: 50**	End Term Exam 15
				Progressive Assessment : 35
Pre Requisite		**: Nil**		
Credit		**2**		Category of Course : PC

RATIONALE:

Workplace safety is very important for each and every employee in the industry because all the workers desire to work in a safe and protected atmosphere. Health and safety are the key factors for all the industries in order to promote the wellness of both employees and employer. It is the duty and moral responsibility of the company to look after the employee protection.
Students will learn the to use basic safety equipment used in industry through practically using it in Laboratory

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Use personal protective equipment properly in work place
- Can distinguish types of fire and can extinguish small scale fire
- Preparation and implementation of different safety protocols and housekeeping activities
- Provide first aid to accident victims

LIST OF EXPERIMENTS:

Sl No.	Name of Experiments
1	Demonstration of Personal Protective Equipment such as Nose Mask, various types of Safety goggles etc
2	Use of Fire extinguisher
3	Preparation of HAZOP study
4	Implementation of 5S principles inside the classrooms and laboratories.
5	Preparation of MSDS for different potentially hazardous chemicals.
6	Implementation of HIRA: Report preparation on identifying hazards of your institute, risk assessment and suggest control measures to mitigate them.
7	First Aid Training

PR:4- MINOR PROJECT

L	T	P		
0	0	4		**Course Code: PR202**
Total Contact Hours				**Practical Assessment**
Practical		: 60Hrs	**Total Marks: 100**	End Term Exam 30
				Progressive Assessment : 70
Pre Requisite		**: Nil**		
Credit		**2**		Category of Course : PR

RATIONALE:

A Minor project is generally requires a larger amount of effort and more independent work than that involved in a normal assignment. It requires students to undertake their own fact-finding and analysis. The students will select the topic, perform and design work. Minor project is as preparation for the students to take on more responsibilities and bigger project in the future. It is a learning experience, which aims to provide students with the opportunity to synthesize knowledge from different areas of learning, and critically and creatively apply it to real life situations. The leadership quality, co-ordination of job and maintaining good communal harmony is an important factor of this type of activity.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Plan a Minor Project
- Execute a Minor Project with team.
- Implement hardware/software/analytical/numerical techniques, etc. based on project requirements.
- Optimize time related works through sharing of work responsibility
- Develop cost awareness and utilisation of fund.
- Prepare a technical report on the project.

GUIDELINES FOR MINOR PROJECT

Unit No.	Topic/Sub-Topic
I	○ Minimum three and maximum five students can form a group for the minor project.
II	○ Project type can include • Development of a simple prototype system/product. • Investigation of performance of some systems using experimental method • Analysis of components/systems/devices using suitable software • Investigation of optimum process/material for product development using market survey. • Solution for society/industry problems

III	○ Project domain may not be limited to the specific area / discipline.
IV	○ Project report to be prepared and submitted by the students with following components: 1. Title 2. Objectives 3. Relevance and significance 4. Methodology 5. Analysis-Simulation/experimentation/survey/testing etc. 6. Result and Discussion 7. Conclusion

ESSENCE OF INDIAN KNOWLEDGE AND TRADITION

L	T	P		
2	0	0		**Course Code: AU202**
Total Contact Hours				**Theory Assessment**
Theory		: 30Hrs		End Term Exam :
			Total Marks: 100	Progressive Assessment :
Pre Requisite		**: Nil**		
Credit		**0**		Category of Course : AU

RATIONALE:

Considering the need of protecting Indian knowledge and tradition, the diploma level students of Automobile Engineering should be facilitated the concepts Indian traditional knowledge and to make them understand the importance of roots of knowledge system and methods of application in today‟s life and how to protect traditional knowledge system. Interpretation of the concepts of Intellectual property to protect the traditional knowledge as well as importance of Traditional knowledge in Agriculture and Medicine must be known.

LEARNING OUTCOMES:

After completion of the course, the students will be able to**:**

- Explain the foundational principles of Indian knowledge systems by exploring the Vedas, Upavedas, Vedangas, and their interrelation with ancient and modern disciplines.
- Develop an appreciation for the integration of traditional Indian practices with modern science, focusing on holistic health care, yoga, and sustainable living practices.
- Analyze case studies to evaluate the practical applications of Indian knowledge systems in modern technological and scientific domains, including AI and ML.
- Foster interdisciplinary thinking by bridging ancient wisdom with contemporary educational and technological frameworks.

DETAILED COURSE CONTENTS:

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
I	Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge (Unani / Siddha/ Ayurveda), Indigenous Knowledge (IK), characteristics, traditional knowledge vis-a-vis indigenous knowledge, traditional knowledge of Odisha	7

II	Protection of traditional knowledge (TK): The need for protecting traditional knowledge, Significance of TK Protection, value of TK in global economy, Role of Governmentto harness TK.	7
III	Legal framework and TK: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act); The Biological Diversity Act 2002 andRules 2004, the protection of traditional knowledge bill, 2016.	6
IV	Traditional knowledge and intellectual property: Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, Geographical Indications (GI).	4
V	Traditional Knowledge in Different Sectors: Traditional knowledge and engineering, Traditional medicine system, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK	6

REFERENCES:

1.	Cultural Heritage of India- Course Material by V. Sivaramakrishna Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014.
2.	Modern Physics and Vedant by Swami Jitatmanand, Bharatiya Vidya Bhavan.
3.	The wave of Life by Fritzof Capra
4.	Tao of Physics by Fritzof Capra
5.	Tarkasangraha of Annam Bhatta, International by V N Jha Chinmay Foundation, Velliarnd, Amaku,am
6.	Science of Consciousness Psychotherapy and Yoga Practices by RN Jha Vidyanidhi Prakasham, Delhi, 2016