Final

DIPLOMA CURRICULUM OF CHEMICAL ENGINEERING (THIRD YEAR) (5^{th} Semester)

(To be implemented from 2026-27)

Prepared by;

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PROGRAMME TITLE: CHEMICAL ENGINEERING

SEMESTER – V

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	CHEPC301 TH:1	Chemical Reaction Engineering		3	0	0	70	30	-	-	100	3
2		CHEPC303 TH:2	Mass Transfer -II		3	0	0	70	30	-	-	100	3
3		CHEPC305 PR:1	Chemical Reaction Engineering Lab		0	0	4	-	-	15	35	50	2
4		CHEPC307 PR:2	Mass Transfer – II Lab		0	0	4	-	-	15	35	50	2
5	Programme Elective	CHEPE301 TH:3	Energy Engineering		3	0	0	70	30	-	-	100	3
6		CHEPE303 TH:4	Petroleum Refining & Petrochemical Technology		3	0	0	70	30	-	-	100	3
7		CHEPE305 PR:3	Fuel Technology Lab		0	0	4	-	-	15	35	50	2
8	Open Elective	Open Elective – I OE301 (Any One) TH:5	a) Universal Human Values b) Leadership and Management Skills c) Professional Skills		3	0	0	70	30	-	-	100	3
9	Summer Internship	SI301	SUMMER INTERNSHIP II*		0	0	0	-	-	15	35	50	2
10	Major Project	PR301 PR:4	MAJOR PROJECT (PHASE – I)		0	0	4	-	-	15	35	50	2
TOTAL					**15**	**0**	**16**	**350**	**150**	**75**	**175**	**750**	**25**

*4-6-weeks internship after 4th Semester

CONTENT DETAILS OF SEMESTER - V

TH:1- CHEMICAL REACTION ENGINEERING

L	T	P		
3	0	0		**Course Code: CHEPC301**
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:

This subject is of great importance in chemical engineering profession. It is necessary to study the principles of kinetics and catalysis, which will provide knowledge in understanding chemical reaction mechanisms. The primary purpose of chemical reaction engineering is optimization of chemical reactors, feed composition and operating conditions.

LEARNING OUTCOMES:

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

- Define the kinetics rate and feasibility of different type of reactions.
- Classify chemical reactions, factors affecting the rate of reaction
- Interpret the effect of temperature on rate constant and rate of reaction
- Derive rate expression for different order reaction and relate rate of reaction with design equation.
- Determine optimal ideal reactor design for multiple reactions for particular yield.
- Analyze the laboratory data for determining the order of re- action and reaction rate constant

COURSE CONTENT DETAILS:

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
I	**CHEMICAL KINETICS**: Classification of chemical reaction; Rate of reaction; Rate constant; Elementary and non-elementary reaction; Molecularity and Order of reaction; Arrhenius equation; Concept of activation energy	**8**
II	**INTERPETATION OF BATCH REACTOR DATA**: Derivation of integrated rate equation for irreversible uni-molecular type of different order reactions (First-order reaction, Second order reaction, Zero order reactions); Half-Life method; Basic idea about constant volume and variable volume batch reactor (no derivation); Solve numerical based on the topics.	**12**
III	**IDEAL REACTORS**: Principle, Operation, Applications, Material Balance, Performance Equation of Batch Reactor, Continuous Stirred Tank Reactor, Plug Flow Reactor; Space velocity Space-time, Residence time	**15**

IV	**CATALYSIS**: Definition of catalysis and its classification with example (Homogeneous, Heterogeneous, Enzymatic and Auto-catalytic); Characteristics of catalytic reaction; Role of Catalyst; Promoter, Inhibitors, Carriers, Enzymes; Catalytic poisoning,	**4**
V	**CHEMICAL EQUILIBRIUM**: Definition and characteristics of Chemical Equilibrium; Reversible reaction with example; Equilibrium Constant; Law of Mass action; LeChatelier's Principle; Hess's Law	**6**
Total		**45**

REFERENCES:

1.	K. A. Gavhane Chemical Reaction Engineering-I, Nirali Prakashan publications,Pune
2.	S C Roy and C Guha, 'A Text book of Chemical Reaction Engineering' Dhanpat Rai & Co. (P) Ltd.,
3.	O. Levenspiel, "Chemical Reaction Engineering", Wiley Easter Ltd., New York.

TH:2- MASS TRANSFER – II

L	T	P		
3	0	0		**Course Code: CHEPC303**
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:

Mass Transfer is the Basic Subject of Chemical Engineering. A Chemical Engineer should know that how an operation is taking place in process industry. Mass Transfer tells us the mechanisms and Concentrations between different phases. All the basic operations in industries are based upon mass transfer. So to understand the mechanism of transfer due to difference in concentrations is explained by mass Transfer.

LEARNING OUTCOMES:

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

- Explain the concepts of mass transfer operations like humidification, drying, extraction, leaching and crystallization.
- Describe working principle of various mass transfer equipment used in industry and its application.
- Solve simple problems of mass transfer

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COURSE CONTENT DETAILS:

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
I	**Humidification and Dehumidification:** Wet and dry bulb temperature; The principle of wet blub temperature theory; Illustrate humidity chart and explain different methods of measurement of Humidity; Different methods of humidification and dehumidification; The construction and working of natural and mechanical draft cooling tower; Solve simple problems	**11**
II	**Drying:** Concept of drying; Moisture content-equilibrium; Bound moisture, Unbound moisture, Free moisture, Critical moisture content, Equilibrium moisture content; The methods of removing liquids from solids; Illustrate constant rate and falling rate period; The construction and working principle of tray dryer, rotary dryer, spray dryer, fluidized bed dryer, dryer for heat sensitive materials; Solve simple problems	**13**
III	**Extraction:** Difference between distillation and extraction**;** Steps followed in liquid-liquid extraction; Selection of solvent for extraction; Distribution Coefficient; Mixer-Settler for batch	**6**

	operation; Applications of liquid-liquid extraction equipment (Sieve Tray Tower, Spray tower, Packed tower, Rotating disk contactor, Pulse column)	
IV	**Leaching:** Principle of leaching; Examples of leaching operation; Factors affecting the rate of leaching. Applications of different industrial leaching equipment	**5**
V	**Crystallization:** Concept of crystallization; Principle of crystallization; Supersaturation; Mechanism of crystallization; Yield of crystallization process; Effect of impurities on crystal formation; Caking of crystals; Construction, Working and application of Swenson-Walker Crystalliser; Material balance of crystalliser	**10**
Total		**45**

REFERENCES:

1.	Treybal, Mass transfer operation, Tata McGraw Hill
2.	McCabe & J M Smith, Unit operation of Chemical Engineering, Tata McGraw Hill
3.	Badgero and Banchero, Introduction to Chemical Engineering, Tata McGraw Hill
4.	K Gavane, Unit operations II, Nirali Publication
5.	Richardson & Coulson, Chemical Engineering Vol-2, Tata McGraw Hill

PR:1- CHEMICAL REACTION ENGINEERING LAB

L	T	P		
0	0	4		**Course Code:** CHEPC305
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:

The Chemical Reaction Engineering lab is an essential component of the Chemical Engineering curriculum, providing students with the practical skills, critical thinking, and experimental knowledge needed to succeed in the chemical engineering industry. It enables them to gain a deeper understanding of chemical processes, reactor design, and optimization, which are crucial for designing safe, efficient, and economically viable industrial processes.

LEARNING OUTCOMES:

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

- Describe the mechanisms and kinetics of chemical reactions in a controlled environment.
- Explain practical experience in operating various types of reactors (e.g., batch, continuous, plug flow, and CSTR).
- Develop skills in experimental design, data collection, and analysis of reaction rates
- Reinforce theoretical concepts learned in lectures (e.g., reaction rates, conversions, reactor design).

LIST OF EXPERIMENTS:

Sl No.	Name of Experiments
1	Demonstrate the operation of Batch reactor
2	Demonstrate the operation of Plug flow reactor
3	Demonstrate the operation of Mixed flow reactor
4	Demonstrate the operation of Combined reactor: Mixed flow -plug flow
5	Demonstrate the operation of Combined reactor: Plug flow -mixed flow

REFERENCES:

1.	Lab Manual
2.	O. Levenspiel, “Chemical Reaction Engineering”, Wiley Easter Ltd., New York.

PR:2- MASS TRANSFER –II LAB

L	T	P		
0	0	2		**Course Code: CHEPC307**
Total Contact Hours				**Practical Assessment**
Practical		: 30Hrs	**Total Marks: 50**	End Term Exam 15
				Progressive Assessment : 35
Pre Requisite		**: Nil**		
Credit		**1**		Category of Course : PC

RATIONALE:

Mass transfer is one of the basic tenets of chemical engineering, and contains many practical concepts that are utilized in countless industrial applications. Students will learn the principle of mass transfer operation through practically using Laboratory equipment used in the process industry.

LEARNING OUTCOMES:

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

- Describe working, construction and operation of Cooling Tower, Driers, Crystallizers used in industry
- Explain the principle of mass transfer used in the Process industry

LIST OF EXPERIMENTS:

Sl No.	Name of Experiments
1	Demonstrate the operation of a Cooling Tower
2	Demonstrate operation of a Tray
3	Demonstrate operation of a Fluidized bed dryer
4	Demonstrate the operation of Open Pan Crystallizer
5	Demonstrate operation of Swenson-Walker Crystallizer
6	Demonstrate the operation of Liquid-liquid Extraction
7	Demonstrate the operation of Solid-Liquid Extraction

REFERENCES:

1.	Lab Manual
2.	Treybal, Mass transfer operation, Tata McGraw Hill

TH:3- ENERGY ENGINEERING

L	T	P		
3	0	0		**Course Code: CHEPE301**
Total Contact Hours				**Theory Assessment**
Practical		: 45 Hrs	**Total Marks: 100**	End Term Exam 70
				Progressive Assessment : 30
Pre Requisite		**: Nil**		
Credit		**3**		Category of Course : PE

RATIONALE:

The primary purpose of energy engineering is to optimize the production and use of energy resources while minimizing energy waste and reducing environmental impact. It addresses the crucial role in optimizing energy production, distribution, and consumption to achieve sustainable development and address global challenges like climate change and energy security.

LEARNING OUTCOMES:

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

- Identify different types of fuel sources for energy production.
- Appreciate the advantages of energy production from renewable energy resources.

COURSE CONTENT DETAILS:

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
UNIT-I	**Fuels**: Classification, Properties, tests and analysis; Coal-origin, classification, storage and handling, carbonization, gasification and briquetting - gasification of biomass.	**15**
UNIT-II	**Liquid fuels**: Petroleum based fuels, synthetic fuels, alcohol and blended fuels, storage and handling.	**06**
UNIT-III	**Gaseous fuels**: Water gas, carbureted water gas, producer gas, coal gas and natural gas.	**05**
UNIT-IV	**Combustion**: Air requirement for solid, liquid and gaseous fuels, Combustion equipment	**06**
UNIT-V	**Renewable energy sources:** Solar energy, Wind energy, Tidal energy, Hydropower, Geothermal energy, Nuclear energy.	**13**
Total		**45**

REFERENCES:

1.	Gupta, "Energy Technology", Khanna Publishing House, New Delhi
2.	G.D.Rai, "Non-conventional energy sources", Khanna Publishers, IV edition, New Delhi,

TH:4- PETROLEUM REFINING & PETROCHEMICAL TECHNOLOGY

L	T	P		
3	0	0		**Course Code: CHEPE303**
Total Contact Hours				**Theory Assessment**
Practical		: 45 Hrs	**Total Marks: 100**	End Term Exam 70
				Progressive Assessment : 30
Pre Requisite		**: Nil**		
Credit		**3**		Category of Course : PE

RATIONALE:

Petroleum Refining and Petrochemical Technology in the Chemical Engineering curriculum is essential for preparing students to meet the growing demands of the energy and chemical industries. This subject provides a comprehensive understanding of the processes involved in transforming crude oil into valuable products and the subsequent production of petrochemicals.

LEARNING OUTCOMES:

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

- Develop overview of petroleum industry and know about origin, formation composition and characterization of crude oil.
- Comprehend primary processing mechanisms of crude to obtain various petroleum cuts.
- Explain secondary conversion techniques and treatment processes in petroleum refinery to get products of desired yield and quality
- Describe manufacturing processes and applications of various petrochemicals
- Grasp environmental and safety aspects in petroleum refinery and petrochemical industries.

COURSE CONTENT DETAILS:

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
UNIT-I	**Introduction to Petroleum**: Origin & formation of crude oil, Composition of crude oil; Properties of petroleum products: API Gravity, Flash point, Fire point, Pour point, Cloud point, Smoke point, Aniline point, Reid Vapour pressure, Octane number, Cetane number; Dehydration and desalting of crudes; General mechanisms for removal of Sulphur.	**8**
UNIT-II	**Primary Processing**: Atmospheric distillation, Vacuum distillation, Treatment of LPG, Gasoline, Kerosene, Diesel and Lube oils; Properties of ATF and Bitumen.	**11**
UNIT-III	**Secondary Processing**: FCCU, Thermal cracking; Hydro cracking; Visbreaking, Coking, Reforming, Alkylation, Isomerization and polymerization processes.	**12**

UNIT-IV	**Petrochemical:** Building blocks, intermediates, major petrochemical and their applications,	**6**
UNIT-V	Chemicals from methane and synthesis gas; Chemicals from Olefins; Chemicals from aromatics; Synthetic fibres; plastics and rubber.	**8**
Total		**45**

REFERENCES:

1.	B.K. Bhaskarao, Bulk Chemicals from Petroleum, Khanna Publishing House
2.	B. K. Bhaskara, "Modern Petroleum Refining Processes", Oxford and IBH Publishing Company, New Delhi
3.	W.L. Nelson, "Petroleum Refinery Engineering", McGraw Hill, New York.
4.	O.P. Gupta, "Elements of Petroleum Refinery Engineering", Khanna Publishing House
5.	Saikat Maitra & O.P. Gupta, "Elements of Petrochemical Engineering", Khanna Publishing House, New Delhi

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PR:3- FUEL TECHNOLOGY LAB

L	T	P		
0	0	4		**Course Code: CHEPE305**
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 : PE

RATIONALE:

The Fuel Technology Laboratory is a vital component of the Chemical Engineering curriculum, designed to provide students with practical experience in the analysis, characterization, and processing of various fuels. This hands-on approach bridges theoretical knowledge with real-world applications, preparing students for the complexities of the energy sector.

LEARNING OUTCOMES:

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

- Analyze and interpret the physical and chemical properties of different fuels.
- Provide hands-on experience in fuel processing techniques, including refining and upgrading methods.
- Instill a strong understanding of safety measures when handling and experimenting with fuels.

LIST OF EXPERIMENTS:

Sl No.	Name of Experiments
1	Determine the Density, Specific gravity and API gravity of given petroleum and petroleum fraction.
2	Determine the flash and fire point of a given fuel by Abel's apparatus or Pensky Marten apparatus.
3	Determine the cloud point and pour point of lubricating oil.
4	Determine the aniline point of a fuel.
5	Determine the viscosity of a given sample oil by using Redwood viscometer.
6	Determine the vapour pressure of a give sample by using Reid vapour pressure apparatus.
7	Determine the smoke point of an illuminating oil to test its ability to burn without producing smoke using a smoke point apparatus.
8	Determine the calorific value of fuels using Bomb Calorimeter.

TH:5(a)- UNIVERSAL HUMAN VALUES

L	T	P		
3	0	0		**Course Code: OE301**
Total Contact Hours				
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam 70
				Progressive Assessment : 30
Pre-Requisite		**: Nil**		
Credit		**3**		Category of Course: OE

RATIONALE:

The Universal Human Values (UHV) course is designed to help diploma students develop a strong ethical foundation, nurturing responsible individuals who contribute positively to society. In an era driven by rapid technological advancements, it is crucial for students not only to gain technical expertise but also to cultivate values that promote harmony, respect, and sustainability.

LEARNING OUTCOMES:

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

- Identify fundamental human aspirations such as happiness and prosperity.
- Differentiate between the self and the body and understand their respective needs.
- Practice self-reflection to improve decision-making, emotional balance, and personal growth.
- Develop respectful and trustworthy relationships within family, friends, and society.
- Explain the role of values like trust, respect, and love in building strong social bonds.
- Promote cooperation and harmony within communities through ethical practices.

DETAILED COURSE CONTENTS:

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
I	**Introduction to Value Education and Human Values:** Concept and Need for Value Education - Understanding the importance of value education in personal and professional life, Differentiating between values and skills. Basic Human Aspirations - Exploring fundamental human aspirations: happiness and prosperity, Methods to achieve these aspirations through right understanding and relationships.	8
II	**Harmony in the Human Being:** Understanding the Self - Differentiating between the 'Self' (I) and the Body, Understanding the needs of the Self and the Body, Harmony of the Self with the Body - Ensuring the harmony of 'I' with the Body, Practices for mental and physical well-being.	8
III	**Harmony in the Family and Society:** Family as the Basic Unit of Society - Understanding values in human relationships, Trust and respect as the foundational values in relationships, Harmony in Society - The concept of an undivided society, Universal human order and world family.	8

IV	**Harmony in Nature and Existence:** Interconnectedness in Nature - Understanding the four orders of nature: material, plant, animal, and human, Mutual fulfillment among these orders, Co-existence in Existence - Holistic perception of harmony in existence, Role of human beings in maintaining environmental balance.	8
V	**Professional Ethics:** Ethical Human Conduct - Integrating values into professional life, Concept of professional ethics and accountability, Case Studies in Professional Ethics - Analyzing real-life scenarios to understand ethical dilemmas, Developing solutions based on universal human values.	8
VI	**Personal Development and Social Responsibility:** Self-Reflection and Self-Exploration - Techniques for self-assessment and personal growth, Setting personal goals aligned with universal values, Social Responsibility - Understanding one's role in society, Participating in community service and social initiatives.	5
Total		45

REFERENCES:

1.	R. R. Gaur, R. Asthana, G. P. Bagaria, A Foundation Course in Human Values and Professional Ethics, 2nd Revised Edition, Excel Books, New Delhi, 2019.
2.	R. R. Gaur, R. Asthana, G. P. Bagaria, Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, 2nd Revised Edition, Excel Books, New Delhi, 2019.
3.	A. Nagraj, JeevanVidya: EkParichaya, Amarkantak, 1999.
4.	A.N. Tripathi, Human Values, New Age Intl. Publishers, New Delhi, 2004.
5.	Moral Thinking: An Introduction To Values And Ethics, Vineet Sahu, IIT Kanpur: https://onlinecourses.nptel.ac.in/noc23_hs89/preview

TH:5(b)- LEADERSHIP AND MANAGEMENT SKILLS

L	T	P		Course Code: OE301	
3	0	0			
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 : OE	

RATIONALE:

This course/subject on Leadership and Management Skills for students undergoing Diploma programmes is an exploration in leading and managing people, majorly in education based on sound and acceptable principles and theories for effective leadership. The leadership skills will enable them to take initiative, guide team efforts, motivate peers, and ensure effective collaboration. They'll learn how to delegate tasks, resolve conflicts, and foster a positive team environment. The management skills will help them in organizing tasks, setting timelines, and ensuring efficient workflow within a team.
It is expected that the students will be able to handle projects with better project outcomes and a earn a more productive learning experience. This will benefit their academic journey, future careers, and overall professional development:

LEARNING OUTCOMES:

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

- Explain the principles of management
- Collaborate across cultures for effective team work
- Communicate with people for a positive work culture
- Demonstrate personal dispositions, skills & abilities of a leader
- Undertake the process of change management
- Design training for staff development
- Adapt suitable leadership style for improved work efficiency.

DETAILED COURSE CONTENT:

Unit No.	Topic/Sub-Topic	Allotted Time (Hour)
I	**Leadership & Management, concept, principles.** • Definition of leadership, management • Leadership theories • Leadership characteristics • Principles of management • Managerial functions • Leader v/s Manager, Leader/Manager traits and character • Leadership Styles	10
II	**Human Resource Management in Organizations** • Human Resource Management: Meaning, Nature, Objectives, Scope • Job & Job analysis. • Staff Development: Need and Objectives of Staff Development, Approaches • Training & development • Organizational Development: Components of OD process. • Learning organization	10
III	**Personal disposition, skills & abilities of leaders** • Self-awareness • Leadership characteristics, traits • Leadership skills & abilities • Emotional intelligence & its components, importance in leadership • Communication skills for effective leadership, barriers to effective communication, Active Listening, Mindful listening. • Leading & Mentorship – Influencing & mentoring	09
IV	**Leader's role in Motivating, Inspiring and Transformative leadership, nurturing team-work** • Goal setting & leadership • Transformative Leadership, vision & envisioning • Motivational role of leader in people management • Group & team • Team dynamics • Conflict management, strategies in managing conflicts	08
V	**Change Management & Leadership** • Models of change • Forces driving change • Change Management – process, goal, importance • The process of change happening in an organization • Key aspects of leadership in change management – responsibilities of a change leader.	08

SUGGESTED ACTIVITIES:

- Group/individual presentation on the basic principles of leadership and management, Discussion on readings - Individual or group presentation of assigned topics in class on leadership and management principles and theories.
- Activities on Envisioning, Goal setting
- ACTION PLAN to be prepared

REFERENCES:

1.	Theories of Educational Leadership and Management (3rd ed.), by Bush, Tony (2003). SAGE Publications, Ltd.
2.	The inspiring leader: unlocking the secrets of how extraordinary leaders motivate. By Zenger, John, Joseph Folkman, and Scott Edinger (2009). New York: McGraw Hill Press.
3.	Knowing yourself. On becoming a leader: the leadership classic. By Bennis, Warren (2009). New York: Basic Books.
4.	Leading Change. By P. Kotter, Harvard Business, 2012.
5.	The Fifth Discipline. By Peter M. Senge, Crwon Currency, 2006.
6.	The Leadership Sutra: An Indian Approach to Power. By Devdutt Pattanaik, – Penguin Random House, 2017.
7.	Leadership and Management. By Dr. A. Chandra Mohan. Himalaya Publishing House, 2010.

TH:5(c)- PROFESSIONAL SKILLS

L	T	P		Course Code: OE301	
3	0	0			
Total Contact Hours			**Total Marks: 100**	**Theory Assessment**	
Theory		: 45Hrs		End Term Exam	70
				Progressive Assessment	30
Pre Requisite		**: Nil**			
Credit		**3**		Category of Course : OE	

RATIONALE:

The term, "Professional skills" carries significant weight in the job market and career development. This open elective course explores various types of professional skills, their significance, and how they can be cultivated and harnessed for career progression. By understanding the landscape of professional skills, student can better position himself or herself for success in the competitive job market. It is crucial to continuously update and adapt the professional skills to stay ahead in a rapidly changing work environment. By investing in professional development, one can enhance employability and open doors to new opportunities.

LEARNING OUTCOMES:

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

- Demonstrate Self-competency and Confidence
- Practice Emotional Competency
- Work in a team work or in collaboration
- Demonstrate problem solving and decision making skills
- Apply time management strategies and techniques effectively
- Apply professional ethics and integrity in professional and personal life

UNIT NO.	CONTENT	ALLOTTED TIME (HOURS)
I Communication Skills:	• Active listening • Verbal and non-verbal communication • Written communication • Presentation skills • Conflict resolution	08
II Teamwork and Collaboration:	• Building trust within a team • Effective collaboration strategies • Role delegation and responsibility sharing • Conflict resolution within a team	08

III Problem- Solving:	• Identifying root causes of issues • Generating solutions and evaluating options • Decision-making under pressure • Critical thinking skills • Triple constraint issues	08
IV Time Management:	• Prioritization and task management • Setting realistic deadlines • Effective time planning and organization	06
V Emotional Intelligence:	• Self-awareness and emotional regulation • Empathy and understanding others' emotions • Managing interpersonal relationships • Motivation • Social skills • Emotional Intelligence (EQ) • Stress management	08
VI Professional Ethics and Integrity:	• Workplace ethics and code of conduct • Confidentiality and data privacy • Professional accountability- • Important Considerations:	05

REFERENCES:

1. Dr. Vitthal Gore: Professional Skills for 21st Century: A Key to Success: Blue Rose- ACADEMIC
2. The ACE of Soft Skills: Attitude, Communication and Etiquette for Success: PEARSON
3. The essence of Leadership: S. Manikutty: Bloomsbury

SUMMER INTERNSHIP – II*

L	T	P		
0	0	0		**Course Code: SI301**
Total Contact Hours				**Practical Assessment**
Practical	: 4-6 weeks		**Total Marks: 50**	End Term Exam : 15
				Progressive Assessment : 35
Pre Requisite	**: Nil**			
Credit	**: 2**			Category of Course : SI

*4-6 weeks internship after 4th Semester

RATIONALE:

Summer Internship - II is to offer a structured and practical learning experience that prepares individuals for their future careers, helps them make informed career choices, and equips them with the skills and knowledge necessary to succeed in their chosen field. This course provides opportunities to students for hands-on industry experience.

LEARNING OUTCOMES:

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

- Apply theoretical knowledge gained in their academic coursework to real-world situations.
- Develop and refine specific skills relevant to the field.
- Gains hands-on experience in a professional network by interacting with mentors and industry professionals.
- Learn to manage their time effectively.
- Clarify career goals.

DETAILED COURSE CONTENTS:

Unit No.	Topic/Sub-Topic
I	**Orientation:** • Introduction to the organization's mission, values, and culture. • Familiarization with workplace policies, procedures, and safety guidelines. • Orientation to the team and organizational structure.
II	**Project-Based Learning:** • Description of the main project or tasks the intern will be working on during the internship. • Detailed project goals and objectives. • Training and guidance on project-specific tools, technologies, or methodologies.
III	**Technical and Skill Development:** • Training sessions or workshops to enhance technical skills relevant to the internship role (e.g., programming languages, software tools, laboratory

	techniques). • Soft skills development, including communication, teamwork, problem solving, and time management
IV	**Mentorship and Supervision:** • Regular meetings with a designated mentor or supervisor for guidance, feedback, and support. • Mentorship objectives and expectations.
V	**Professional Development:** • Sessions on professional etiquette, networking, and building a personal brand • Resume writing and interview preparation workshops.
VI	**Industry and Field-Specific Knowledge:** • Lectures, seminars, or presentations on industry trends, best practices, and emerging technologies. • Guest speakers from the field to share insights and experiences.
VII	**Reporting and Documentation:** • Training on how to document project progress, results, and findings. • Practice in creating reports, presentations, or other deliverables.
VIII	**Ethics and Professionalism:** • Discussions on ethical considerations within the field. • Scenarios and case studies related to ethical decision-making
IX	**Feedback and Evaluation:** • Regular performance evaluations and feedback sessions. • Self-assessment and goal-setting exercises.
X	**Networking and Industry Exposure:** • Opportunities to attend industry conferences, webinars, or networking events. • Encouragement to connect with professionals in the field.

NOTE

As per AICTE guidelines, in Summer Internship-I, students are required to be involved in Inter/ Intra Institutional Activities viz;

- Training with higher Institutions;
- Soft skill training organized by Training and Placement Cell of the respective institutions;
- contribution at incubation/ innovation /entrepreneurship cell of the institute;
- participation in conferences/ workshops/ competitions etc.;
- Learning at Departmental Lab/ Tinkering Lab/ Institutional workshop;
- Working for consultancy/ research project within the institutes and

- Participation in all the activities of Institute's Innovation Council for eg: IPR workshop/Leadership Talks/ Idea/ Design/ Innovation/ Business Completion/ Technical Expos etc.

PR:4- MAJOR PROJECT

L	T	P		Course Code: PR301	
0	0	4			
Total Contact Hours			**Total Marks: 50**	**Practical Assessment**	
Practical		: 60Hrs		End Term Exam	15
				Progressive Assessment	35
Pre Requisite		**: Nil**			
Credit		**2**		Category of Course : PR	

RATIONALE:

A Major 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. Major 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

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

GUIDELINES FOR MAJOR 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