VISION:

The vision of the department is to advance undergraduate and postgraduate programs to achieve national and international recognition, exemplifying the dual commitment to education and research.

MISSION OF THE DEPARTMENT:

To educate the next generation Engineers of Chemical and Petroleum.
To prepare the students for leadership not only for Chemical Engineering and Petroleum Engineering profession but also for diversified careers.
To create knowledge and to provide multidisciplinary solutions to broad societal problems.
To foster and encourage the pursuit of new knowledge and innovative research in Chemical & Petroleum Sciences and Engineering in partnership with Industry.
To create a vibrant research environment in collaboration with National and International Institutes of Excellence.

Program Educational Objective (PEO)

PEO 1
Shall apply fundamental and advanced knowledge and skills in basic and engineering sciences and in Chemical Engineering, to find suitable solutions to technological challenges and problems in various areas of engineering and real life areas using modern tools.

PEO 2
Shall practice Chemical Engineering in a responsible, professional, and dedicated manner by functioning effectively either as an individual or as a member of multi – disciplinary teams, for the benefit of the industry and society at large without detriment to environment and sustainable development.
PEO 3
Shall acquire good job opportunities in industries or pursue higher studies.

PEO 4
Shall develop the ability to engage in lifelong learning, research and develop in a responsible, professional, dedicated and ethical manner for the benefit of the industry and society at large.

Program Outcomes (POs)

Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals,

and an engineering specialization to the solution of complex engineering problems.

2. 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.

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

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

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

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

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

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

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

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

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

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

Program Specific Outcomes (PSO'S)

PSO1
Professional Skills: An ability to understand the basic concepts in Chemical Engineering and to apply them to various areas, like production, drilling, reservoir etc., in the design and implementation of complex systems

PSO2
Problem-Solving Skills: An ability to solve complex Chemical Engineering problems, using the latest hardware and software tools, along with analytical skills to arrive the cost effective and appropriate solutions.

II YEAR

Course Code	MATERIALS SCIENCE AND ENGINEERING
R19ES2103	

COURSE OUTCOMES

After the course, the students will be able to:

- Equipped with knowledge to understand material selection diagram, evaluation of equipment life and prediction of life of the equipment.
- Acquiring the abilities to carryout reliability studies.
- Ready to carryout equipment failure analysis and propose the remedial measures

Course Code	CHEMICAL PROCESS PRINCIPLES
R19PCC2105	

COURSE OUTCOMES

A student who successfully completes this course will be able to:

- Learn all background information/charts/datasheets required to carry out process calculations. Some of these are vapor pressure correlations, latent heat correlation, steam tables, psychrometric charts, enthalpy-concentration diagrams etc.,
- Formulate and solve simple and moderately complex process calculations associated to industrially prominent chemical processes and technologies.
- Conceptualize an integrated methodology that encompasses the knowledge in other subjects (Physical Chemistry, Thermodynamics and Mathematics) and MS Excel for a systematic and structured approach towards chemical process calculations.
- Analyze chemical processes through the power of modeling and computation. These include back-calculation methods, inventory losses and revenue related assessment etc.

Course Code	MECHANICAL UNIT OPERATIONS
R19PCC2106	

COURSE OUTCOMES

After completion of course, students would be able to:

- Particle characterizations and solids handling.
- Mixing and size reduction of solids.
- Screening and filtration.
- Equipment associated with solid -fluid mechanical operations such as gravity settlers, thickeners, classifiers, clarifiers, sedimenters and cyclones.
- Industrial case studies associated with mechanical unit operations.
- Conceptual design of equipment in mechanical unit operations.

Course Code	MECHANICAL UNIT OPERATIONS LAB
R19PCC2109	

COURSE OUTCOMES

- Develop knowledge on various mechanical separation operations used in a chemical industry.
- Develop knowledge on estimation of particle size, power requirement and surface area.
- Understand the process of froth floatation and sedimentation techniques

Course Code	MOMENTUM TRANSFER
R19PCC2207	

COURSE OUTCOMES

By mastering the fluid mechanics course, the students shall be able to:

- Analyze fluid flow in circular and non-circular conduits.
- Do calculations associate to the estimation of friction factor and pressure drop in circular conduits.
- Do calculations involving Bernoulli's equation for the transport of acidic, alkaline, hydrocarbon and miscellaneous incompressible fluids in pipelines.
- Calculate the pressure drops and energy requirements associated to compressible fluid flow in circular and rectangular ducts.
- Estimate pressure drop in packed and fluidized beds.
- Rigorously carry out various calculations associated to fluid flow in various types of pumps, fans and blowers.
- Calculate, analyze and calibrate various flow measuring devices.

Course Code	CHEMICAL ENGINEERING THERMODYNAMICS– I
R19PCC2204	

COURSE OUTCOMES

After successful completion of this course, The students will be able to:

- Solve problems using the energy balance appropriate for a system.
- Solve problems using the entropy balance appropriate for a system.
- Evaluate, manipulate and use thermodynamic partial derivatives.
- Correctly use a thermodynamic property chart and steam tables.
- Acquire an ability to identify, formulate and solve engineering problems.
- Acquire adequate ability to use techniques, skills and modern engineering tools necessary for engineering practice.

R19PCC2205	**PROCESS INSTRUMENTATION**

COURSE OUTCOMES

After completion of course, students would be able to:

The students will be able to:

- Understand the basic elements of an instrument and its characteristics
- Become familiar with various types of instruments for the measurement of various process variables like temperature, pressure, vacuum, head, level, composition, flow and density.
- Get a clear perspective of various recording, indicating, signaling instruments and transmission of instrument readings
- Get an understanding of instrumentation diagrams, control center, process analysis and digital instrumentation

Course Code	**PROCESS HEAT TRANSFER**
R19PCC2206	

COURSE OUTCOMES

Upon successful completion of this course, the students will be able to:

- Understand the basic laws of heat transfer.
- Account for the consequence of heat transfer in thermal analyses of engineering systems.
- Analyze problems involving steady state heat conduction in simple geometries.
- Develop solutions for transient heat conduction in simple geometries.
- Obtain numerical solutions for conduction and radiation heat transfer problems.
- Understand the fundamentals of convective heat transfer process.
- Evaluate heat transfer coefficients for natural convection.
- Evaluate heat transfer coefficients for forced convection inside ducts.
- Evaluate heat transfer coefficients for forced convection over exterior surfaces.
- Analyze heat exchanger performance by using the method of log mean temperature difference.
- Analyze heat exchanger performance by using the method of heat exchanger effectiveness.
- Calculate radiation heat transfer between black body surfaces as well as grey body surfaces.

Course Code	
R19PCC2207	**MOMENTUM TRANSFER LAB**

COURSE OUTCOMES

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

- Operate fluid flow equipment and instrumentation.
- Collect and analyze data using momentum transfer principles and experimentation methods.
- Prepare reports following accepted writing and graphical techniques.
- Perform exercises in small teams.
- Demonstrate principles discussed in momentum transfer lecture course.
- Demonstrate appropriate work habits consistent with industry standards.

R19PCC2208	**PROCESS HEAT TRANSFER LAB**

COURSE OUTCOMES

Upon successful completion of this lab course, the student will be able to:

- Understand the basics of experimental techniques for heat transfer measurements.
- Operate the heat transfer equipment like heat exchangers
- Process experimental data and obtain correlations to predict heat transfer coefficients for design of heat transfer systems.
- Conduct the experiments at R & D level in the industry
- Understand the professional and ethical responsibilities in the field of heat transfer.
- Produce a written laboratory report.

III YEAR

Course Code	CHEMICAL ENGINEERING THERMODYNAMICS –II
R19PCC3101	

COURSE OUTCOMES

After completion of course, students would be able to:

- Calculate the sensible and latent heat effects.
- Determine the heat effects of industrial reactions.
- Apply residual and excess property relations.
- Apply the concept of fugacity and estimate partial molar properties.
- Calculate the VLE data using Raoult's law, modified Raoult's law, Henry's law activity coefficient models, generalized gamma/phi formulation and K-values.
- Calculate the VLE data using equation of state.
- Estimate the reaction equilibrium constant and equilibrium conversion for liquid phase reactions, gas phase reactions and industrial reactions.
- Apply the phase rule for reacting and non-reacting systems.

Course Code	CHEMICAL REACTION ENGINEERING – I
R19PCC3102	

COURSE OUTCOMES

After completion of course, students would be able to:

- Apply the reaction rate concepts.
- Interpret the batch reactor data for determination of reaction kinetics for various reaction.
- Design the different types of reactors.
- Perform the size comparison of single, multiple reactor systems & recycle reactor.
- Design different reactors for parallel and series reactions.
- Analyze the effects of temperature and pressure on reaction kinetics and equilibrium conversion from a thermodynamic point of view.
- Design the reactors for non-isothermal, adiabatic and non-adiabatic operations for carrying out single reactions
- Apply the Concept of exothermic reactions in mixed flow reactors as a special case.

Course Code	MASS TRANSFER OPERATIONS-I
R19PCC3103	

COURSE OUTCOMES

After completion of course, students would be able to:

- Estimate the diffusivities and diffusion rates of gases and liquids for diffusion through solids, liquids and gases.
- Estimate the mass transfer coefficients using mass transfer theories for laminar flow and turbulent flow.
- Calculate interphase mass transfer coefficients.
- Calculate the number of equilibrium stages using McCabe-Thiele and enthalpy concentration methods.
- Calculate the number of equilibrium stages using Kremser equation and graphical methods for absorption and stripping.
- Design stage wise and continuous gas-liquid contact towers for distillation, absorption and stripping
- Design equipment for Gas-Liquid Operations in general.

Course Code	PROCESS DYNAMICS & CONTROL
R19PCC3104	

COURSE OUTCOMES

After completion of course, students would be able to:

- Derive transfer functions for first order, pseudo second order and second order systems.
- Apply Laplace transforms to get solutions of transfer function equations for different types of systems.
- Correlate the underdamped second order systems to the real-life situations.
- Calculate the overall transfer function and thus offset calculation from the control system block diagram.
- Implement the principals of advanced controllers and their strategies.
- Apply the concept of stability, stability criterion and frequency response analysis for sinusoidal forcing functions.
- Tune the process controllers.
- Determine the dynamic behavior of a process experimentally.
- Design and operate control valves.

Course Code	**PETROLEUM REFINERY ENGINEERING (PROFESSIONAL ELECTIVE – I)**
R19PEC3105A	

COURSE OUTCOMES

- After completion of course, students would be able to: Emphasize different operations in petroleum refining.
- Estimate the properties of crude oils and petroleum fractions and their significance in meeting the fuel specifications.
- Apply various processes and production steps involved in primary separation of crude oil into various products and intermediate product streams.
- Assess different processes and production steps involved to convert low value heavy fuels to high value lighter liquids.
- Apply various processes and production steps involved in treating / reforming the intermediate products to enhance their quality to a level sufficient for routing or blending to a final fuel product.
- Assess the pollution in petroleum refining to apply suitable treatment technologies.

Course Code	**AIR POLLUTION AND CONTROL (PROFESSIONAL ELECTIVE – I)**
R19PEC3105B	

COURSE OUTCOMES

After completion of course, students would be able to:

- Apply knowledge about the nature, origin of air pollution and impact of the air pollution on human beings, plants and materials.
- Undertake the sampling and analysis of pollutants (Monitoring of air pollutants)
- Apply the thermodynamic aspects of air pollution control methods.
- Apply the updated engineering technologies to control air pollution.
- Assess various pollution control technologies to control of specific air pollutants like Sox, Nox, organic vapors etc.
- Interpret the legislations according to the design and operational requirements.

Course Code	**PETROLEUM ANALYSIS – LABORATORY**
R19PCC3106	

COURSE OUTCOMES

After completion of course, students would be able to:

- Handle various apparatus/equipment for petroleum analyses and to carry out the tests on corrosiveness of petroleum products.
- Carry out the tests for Reid vapor pressure, viscosity, smoke point, flash point & fire point, aniline point, cloud & pour point, softening point, calorific value.
- Determine the distillation characteristics (ASTM curves) of crude oil, diesel, gasoline and kerosene.
- Do the tests on water content of different petroleum products.

Course Code	MASS TRANSFER OPERATIONS – LABORATORY
R19PCC3107	

- Carry out the tests on corrosiveness of petroleum products.

COURSE OUTCOMES

After completion of course, students would be able to:

- Apply Fick's law for estimating the mass transfer rates and diffusion coefficients.
- Estimate the diffusivity coefficients for solids and vapors.
- Determine the mass transfer coefficients experimentally.
- Understand the challenges of handling mass transfer equipment.
- Generate and validate the VLE data.
- Compare and validate the HETP values for various column packings.
- Compare and validate the mass transfer coefficients for surface evaporation and wetted wall column.
- Use techniques, skills, and modern engineering tools necessary for engineering practice.
- Estimate the stage efficiency of cross current leaching.

Course Code	INSTRUMENTATION, PROCESS DYNAMICS & CONTROL – LABORATORY
R19PCC3108	

COURSE OUTCOMES

After completion of course, students would be able to:

- Calibrate and determine the time lag of various first and second order instruments.
- Perform experiments to find the response in single and two capacity systems with and with-out interaction.
- Apply the advanced control methods used for complex processes in the industries.
- Perform different experiments like Temperature, level and pressure control.
- Carry out experiments on the open loop (Manual control) and the on/off controller, Proportional controller, PI controller, PD controller, PID controller, Tuning of controller (Open loop and close loop methods).
- Operate the control valve and assess its flow characteristics.
- Estimate the damping coefficient and response of U-tube manometer.

Course Code	SOCIALLY RELEVANT PROJECT
R19PCC3119	

COURSE OUTCOMES

After completion of course, students would be able to:

- Assess the needs and problems of society.
- Design and implement the system in the project.
- Develop a sense of social and civic responsibility.
- Acquire leadership qualities to work in a team.

Course Code	**INDUSTRIAL VISITS (LOCAL & OUTSIDE)**

- Develop competence required for working together and sharing responsibility.

COURSE OUTCOMES

After completion of course, students would be able to:

- Differentiate between the academic training and its relevance to industry.
- Understand the industrial safety measures.

Course Code	**MOOCS (NPTEL/ SWAYAM) FOR HONORS/MINORS DEGREE**

COURSE OUTCOMES

After completion of course, students would be able to:

- Overcome the digital divide in acquiring fast developing technologies / knowledge and be part of digital revolution.
- Acquire subject specific expert knowledge from National Resource Pool.
- Understand his /her academic / professional priorities for future development.

Course Code	MASS TRANSFER OPERATIONS-II
R19PCC3201	

COURSE OUTCOMES

After completion of course, students would be able to:

- Analyze liquid-liquid equilibrium data.
- Design single stage and multi stage liquid extractors.
- Make calculations using psychometric charts for humidification and drying operations.
- Prepare the adsorption isotherm, screen and design adsorption equipment.
- Apply the basic concepts for design of ion exchange systems
- Identify and analyze the membrane separation processes based on the driving force.
- Identify the membranes and design membrane modules for a specific use.

Course Code	CHEMICAL REACTION ENGINEERING – II
R19PCC3202	

COURSE OUTCOMES

After completion of course, students would be able to:

- Carry out RTD studies on non-ideal flow reactors and determine the conversions obtained.
- Fit the experimental data to suitable RTD model like dispersion model, tanks-in-series model and the convection model and to predict the conversions from these models.
- Predict the effect of earliness of mixing, segregation and RTD on conversion.
- Determine the kinetics of solid catalyzed reactions and carry out experiments for determining the rates of solid-catalyzed reactions.
- Determine the rate of deactivation in solid-catalyzed reactions.
- Apply the general rate equations of fluid-fluid reactions with the concentration profiles to design the equipment.
- Determine the rate controlling step in fluid-particle reactions.

Course Code	**CHEMICAL PROCESS SAFETY (OPEN ELECTIVE – I)**
R19OEC3203A	

COURSE OUTCOMES

After completion of course, students would be able to:

- Access the various hazards involved in handling hydrocarbons in Oil & Gas sector. Visualization of all possible safety issues at all the phases of industry by applying the techniques like HAZOP, QRA etc.
- Apply procedures to maintain the industrial hygiene.
- Design various stages of operations without safety risk.
- Measure and monitor safety indices.
- Provide methods to prevent fires and explosions.

Course Code	**FUNDAMENTALS OF PETROLEUM REFINING (OPEN ELECTIVE – I)**
R19OEC3203B	

- Operate liquid and gas relief systems.

COURSE OUTCOMES

After completion of course, students would be able to:

- Assess different crude oils and evaluate petroleum fractions according to specifications.
- Apply the chemistry of petroleum in assessing different petroleum processes.
- Distinguish between atmospheric distillation and vacuum distillation units in petroleum refining.
- Differentiate the secondary processes like the catalytic cracking, hydrocracking, alkylation, catalytic reforming and isomerization.
- Know the necessity of residue reduction, and asphalt production while treating different crude oils.
- Realize the importance of hydrotreating of petroleum fractions and Supporting processes like production of hydrogen and sulfur.

Course Code	**RENEWABLE ENERGY SOURCES (OPEN ELECTIVE – I)**
R19OEC3204	

COURSE OUTCOMES

After completion of course, students would be able to:

- Assess the depletion rate of conventional energy resources and importance of renewable energy sources.
- Identify the alternate viable energy sources to meet the energy requirements.
- Apply the solar energy, bio energy, wind energy, ocean energy, geothermal energy and hydrogen energy as alternate sources wherever necessary as per the economics.
- Design, construct and operate the biogas plants for domestic and industrial applications.
- Test and implement the application of methanol, ethanol and compressed biogas (CBG) as automotive fuels.

Course Code	**SOLID WASTE MANAGEMENT (PROFESSIONAL ELECTIVE – II)**
R19PEC3205	

Course Code	**GREEN PROCESS TECHNOLOGIES (PROFESSIONAL ELECTIVE – II)**
R19PEC3206	

COURSE OUTCOMES

After completion of course, students would be able to:

- Characterize the solid wastes.
- Design the collection systems of solid wastes.
- Design the treatment of safe disposal of solid wastes.
- Design and operate the landfill system for municipal solid wastes.
- Design a composting or anaerobic digestion facility.

COURSE OUTCOMES

After completion of course, students would be able to:

- Apply the fundamentals of green chemistry and green processes.
- Implement the novel techniques such as ultrasound and microwave for the development of green process technologies.
- Develop the methods such as ionic liquids, super critical CO_2 and electrochemical process in the green process technologies.
- Implement the photocatalytic engineering, bio-catalysis and bio-processes in the green process technologies.

Course Code	**GENERAL CHEMICAL TECHNOLOGY (PROFESSIONAL ELECTIVE – III)**
R19PEC3207A	

COURSE OUTCOMES

After completion of course, students would be able to:

- Assess the importance of chemical process industries over the other manufacturing industries.
- Apply the details of chemical process equipment, thermodynamics, and the chemical process principles in a process industry.
- Study the corrosion aspects so as to select the suitable materials of construction for handling, storage and processing of various chemicals.
- Implement safety measures at various stages of processing plants.
- Judge and troubleshoot during any critical issues that may crop-up in operation of process plants.

Course Code	**INDUSTRIAL BIOTECHNOLOGY (PROFESSIONAL ELECTIVE – III)**
R19PEC3207B	

COURSE OUTCOMES

After completion of course, students would be able to:

- Appreciate the scope and relevance of biochemical engineering and biotechnology in various applications.
- Apply the principles of animal biotechnology, animal cell culture, monoclonal antibodies, transgenic animal and gene therapy in diverse applications.
- Apply the concepts of biotechnology in the design of various processing units.
- Gain comprehensive understanding of ethical, social, technical and economical aspects of various industries based on biotechnology.
- Extend the application of biotechnology in various novel and critical sectors.

Course Code	**CHEMICAL REACTION ENGINEERING – LABORATORY**
R19PCC3208	

COURSE OUTCOMES

After completion of course, students would be able to:

- Design experiments for the determination of the order of the reaction and reaction rate constant for new reaction systems by using batch, CSTR and PFR.
- Analyze and interpret given reaction rate data using various methods.
- Calculate the effect of flow rate, concentration of reactants on conversion in reactors (CSTR/PFR) in series.
- Compare the effect of residence time on conversion for CSTR and PFR.
- Use the experimental kinetic data for reactor design.

Course Code	**MATHEMATICAL METHODS – LABORATORY**
R19PCC3209	

COURSE OUTCOMES

After completion of course, students would be able to:

- The students are able to write MATLAB code and solve typical problems encountered in chemical engineering subjects.

Course Code	**SUMMER INTERNSHIP (4-6 WEEKS)**
R19PT3212	

COURSE OUTCOMES

After completion of course, students would be able to:

- Work safely in Industrial environment.
- Work with various interest groups, disciplines, professionals, managers, technicians etc.
- Polish the engineering skills by applying the knowledge in day-to-day operations, trouble-shooting and minor-modifications.
- Build relations between University and Industry that will help mutual cooperation over long-term.
- Develop/strengthen the basic skills of interviewing, analysis, report writing, communication, decision-making, and problem solving.

Course Code	**MOOCS (NPTEL/ SWAYAM) FOR HONORS/MINORS DEGREE**

COURSE OUTCOMES

After completion of course, students would be able to:

- Overcome the digital divide in acquiring fast developing technologies / knowledge and be part of digital revolution.
- Acquire subject specific expert knowledge from National Resource Pool.
- Understand his /her academic / professional priorities for future development.