0905201 Computer Applications in Chemical Engineering (2 Credit Hours)
Prerequisite: (1900100)
An applied course focusing on use of Internet resources and computer packages to equip the students with the essentials of using computers in chemical engineering. Internet: Use of Web search engines; Useful chemical engineering links and databases; World Wide Virtual Libraries. Computer Packages: Getting started with some available packages used in typical modern chemical engineering textbooks, e.g., EZ-Solve, Polymath, and Matlab. Students will undertake a number of assignments involving solving problems utilizing Internet acquired information as well as the numerical, symbolic and graphical capabilities of the computer packages.

0905202 Physical Chemistry (3 Credit Hours)
Prerequisite: (0303101)

0905211 Chemical Engineering Principles (1) (3 Credit Hours)
Prerequisite: (0303101)
0905212 Chemical Engineering Principles (2) (3 Credit Hours)
Prerequisite: (0905211)

0905231 Mathematical Methods in Chemical Engineering (3 Credit Hours)
Prerequisite: (0301201)

0905241 Fluid Mechanics (3 Credit Hours)
Prerequisite: (0905211)

0905301 Numerical Methods in Chemical Engineering (3 Credit Hours)
Prerequisite: (0905201)

0905322 Thermodynamics (1) (3 Credit Hours)
Prerequisite: (0905202, 0905211)
0905323  Thermodynamics (2)  (3 Credit Hours)
Prerequisite: (0905322)

0905331  Process Modeling by Statistical Methods  (3 Credit Hours)
Prerequisite: (0905231)
Introduction to stochastic and deterministic modeling of simple chemical engineering processes. Essential probability and statistical methods: probability laws, random variables and distributions. Descriptive statistics, estimation and tests of hypotheses, regression and correlation analysis.

0905341  Transport Phenomena  (3 Credit Hours)
Prerequisite: (0905241)

0905342  Solid Particulates  (3 Credit Hours)
Prerequisite: (0905241)
Characterisation of solids: solid properties, size analysis, solids in bulk, handling and flow of solids, size reduction. Fluid particle systems: packings and packed columns, filtration, centrifugation, mixing, flotation, fluidization.

0905343  Process Heat Transfer  (3 Credit Hours)
Prerequisite: (0905341)
0905381 Strength of Materials and Equipment Design (3 Credit Hours)
Prerequisite: (Dept. approval)
Introduction to material properties. Stresses and strains, shearing force and moment diagram, stresses due to bending, deflection, torsion, buckling, analysis of thin and thick cylindrical shells and spherical shells. Theories of failure. Welding. General design considerations for flat bottomed cylindrical vessels, cylindrical vessels with formed closures under internal and external pressure. Design of tall vertical vessels. Design of supports.

0905401 Management for Chemical Engineering (3 Credit Hours)
Prerequisite: (Dept. approval)
Theories of management, Forecasting, Organisation of chemical engineering projects, Breakeven analysis, project evaluation and cashflow diagrams. Critical path method, Decision trees and alternatives, Inventory control.

0905421 Chemical Reaction Engineering (1) (3 Credit Hours)
Prerequisite: (0905323)

0905422 Chemical Reaction Engineering (2) (3 Credit Hours)
Prerequisite: (0905421)

0905423 Biochemical Engineering (3 Credit Hours)
Prerequisite: (0905421)
0905431 Process Analysis and Simulation  
Prerequisite: (0905301)  
Techniques for analysis, modeling and simulation of typical process equipment and integrated processes, both continuous and non-continuous. Application of necessary analytical and numerical mathematical algorithms to selected cases.

0905441 Mass Transfer Operations  
Prerequisite: (0905323)  
Interphase mass transfer, equilibrium stage concept. Vapor-liquid processes. Distillation: equilibrium data, batch, flash, binary, steady state, multicomponent, steam, azeotropic and extractive distillation. Gas absorption: equilibrium data, multistage continuous contacting, non isothermal, multicomponent, design of packed column. Solvent extraction: phase equilibria, stage-wise calculations, transfer units, tower design, mixer-settler, design of stirred vessel systems. Leaching: equilibrium relations, stage wise calculations.

0905442 Heat and Mass Transfer Operations  
Prerequisite: (0905343, 0905441)  

0905451 Local Chemical Industries  
Prerequisite: (0303102, 0905212)  
Studying the basic principles, raw materials and process description for a number of industries such as, industrial gases, inorganic acids, sodium, potassium and phosphates industries. Cement; Ceramic; Glass; Oil and Fat; Soap and Detergents; Surface coating industries; Specifications and Standards. Local Regulations.
0905452 Petroleum Refining Engineering  (3 Credit Hours)
Prerequisite: (0905441)

0905461 Chemical Engineering Laboratory (1)  (1 Credit Hour)
Prerequisite: (0905241, 0905323)
Selected experiments drawn from (0905241), (0905322), (0905323). For example pumps, fans, jets, pressure drops in closed and open conduits, flow measurements and refrigeration, stirling cycle, air conditioning, vapor-liquid equilibrium, liquid-liquid equilibrium.

0905462 Chemical Engineering Laboratory (2)  (1 Credit Hour)
Prerequisite: (0905342, 0905343)
Selected experiments drawn from (0905342) and (0905343). For example crushing and grinding, screening, sedimentation, flotation, fluidization, filtration, mixing and heat conduction, free and forced convection, plain and finned exchangers, fluidized beds, two-phase heat transfer.

0905463 Chemical Engineering Laboratory (3)  (1 Credit Hour)
Prerequisite: (0905442 or concurrently)
Selected experiments drawn from (0905441), (0905442). For example: Wetted wall column, ion exchange, absorption, air-water simulator, distillation, extraction, cooling tower performance, tray drier, evaporation, crystallization, and adsorption.

0905471 Fuel and Energy  (3 Credit Hours)
Prerequisite: (0905343)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>0905473</td>
<td>Process Safety Engineering</td>
<td>(2 Credit Hours)</td>
</tr>
<tr>
<td></td>
<td><strong>Prerequisite:</strong> (4\textsuperscript{th} year level)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Safe handling of hazardous chemicals and toxic materials. Theories of ignition, flames, fire and explosion. Methods of protection and prevention of hazards: containment, suppression, explosion relief, inerting. Safety codes and check lists considerations in design and operation. Case studies.</td>
<td></td>
</tr>
<tr>
<td>0905474</td>
<td>Engineering Materials Science</td>
<td>(3 Credit Hours)</td>
</tr>
<tr>
<td></td>
<td><strong>Prerequisite:</strong> (Dept. approval)</td>
<td></td>
</tr>
<tr>
<td>0905475</td>
<td>Corrosion and Electrochemical Engineering</td>
<td>(3 Credit Hours)</td>
</tr>
<tr>
<td></td>
<td><strong>Prerequisite:</strong> (Dept. approval)</td>
<td></td>
</tr>
<tr>
<td>0905481</td>
<td>Process Design</td>
<td>(3 Credit Hours)</td>
</tr>
<tr>
<td></td>
<td><strong>Prerequisite:</strong> (0901420, 0905441)</td>
<td></td>
</tr>
<tr>
<td>0905509</td>
<td>Selected Topics in Chemical Engineering</td>
<td>(3 Credit Hours)</td>
</tr>
<tr>
<td></td>
<td><strong>Prerequisite:</strong> (Dept. approval)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Coverage of the various aspects of a special topic of interest to chemical engineers. The title of the topic to be covered at each offering of the course will be pre-announced by the Department. As a guideline, topics could include one of the following: water desalination, food engineering, experimental design, mixing, project engineering, applied surface chemistry, process instrumentation and measurements, analysis and simulation of chemical processes, mineral processing, process catalysis.</td>
<td></td>
</tr>
</tbody>
</table>
0905531 Process Optimization  
Prerequisite: (0905301)  
(3 Credit Hours)  

0905541 Separation Processes  
Prerequisite: (0905441)  
(3 Credit Hours)  
Multicomponent distillation. Azeotropic and extractive distillation. Liquid-Liquid separation processes. Membrane separation processes including reverse osmosis and ultrafiltration. Dialysis, chromatography etc...

0905551 Extractive Metallurgy  
Prerequisite: (0905342)  
(3 Credit Hours)  

0905553 Polymers and Plastics Engineering  
Prerequisite: (0905421)  
(3 Credit Hours)  

0905554 Fertilizer Technology  
Prerequisite: (0905441)  
(3 Credit Hours)  
0905561  Chemical Engineering Laboratory (4)  (1 Credit Hour)
Prerequisite: (0905422, 0905571)
Selected experiments drawn from (0905421), (0905422), (0905571). For example: determination of reaction kinetics, use of plug flow and continuous flow stirred tank reactors, measurement of residence time distributions. Gas absorption with chemical reaction. Selected experiments on temperature, pressure, level and pH control. Simulation and analogue computing, servomechanisms, and instrumentation.

0905571  Process Dynamics and Control  (3 Credit Hours)
Prerequisite: (0905231, 0905441)

0905572  Environmental Engineering  (3 Credit Hours)
Prerequisite: (0905342)

0905582  Chemical Plant Design  (3 Credit Hours)
Prerequisite: (0905441, 0905451)

0905597  Practical Project  (3 Credit Hours)
Prerequisite: (5th year level)
An individually chosen project. This project should allow an element of original work by each student, and will be drawn from the facilities available in the Department. A full report covering all aspects of the work must be submitted.
0905598 Project (1)  
(1 Credit Hour)  
Prerequisite: (Results in 121 Cr. Hrs., 0905481 or concurrently)  
A group of students perform flowsheet synthesis and/or selection for a chemical process including material and energy balances for the selected process.

0905599 Project (2)  
(2 Credit Hours)  
Prerequisite: (0905598)  
Each student performs a detailed study of a chemical engineering problem from the selected process chosen in project (1). The final report submitted by the group should include mass and energy balances, process flow diagram and detailed design of one or more items of equipment and other equivalent tasks.