BEng (Hons) Chemical and Renewable Energy Engineering - E401

1. Objectives

The programme is intended to provide an in-depth knowledge and understanding of the development, design and operation of chemical processes and plants together with the proper management and optimisation of energy use from a technological engineer's point of view. It focuses on specific chemical engineering modules like thermodynamics, heat transfer, process design and simulation, and energy related modules such as energy technology, energy conversion, energy-related processes, industrial practices (energy auditing), and on modern energy production and utilisation in the built environment by means of sustainable and environmentally compatible technologies**.**

2. Entry Requirements

As per General Entry Requirements for Admission to the University for Undergraduate Degrees.

3. Programme Requirements

Credit in Physics at SC/ 'O' Level.
2 GCE 'A' Level Passes in Mathematics and Chemistry.

4. Minimum Requirements for the Awards

Modules	**Minimum Credits for Degree Award**	**Credits Required for Diploma Award**
Humanities & Management	9	3
Basic Sciences & Mathematics	9	6
Engineering	112	45
Diploma Project*	-	6
Total	**130**	**60**

Note:

- For the degree award all core modules prescribed by the department must be completed.
- Industrial training must be completed satisfactorily for the award of the degree.
- * A student may opt for a Diploma in Chemical and Renewable Energy Engineering provided s/he satisfies the above minimum requirements. The Diploma project would normally be of 8 weeks duration for an input of at least 90 hours.

5. Programme Duration

	Normal (Years)	**Maximum (Years)**
Degree	4	7
Diploma	2	3

6. Credits per Year: Minimum 18, Maximum 48 subject to Regulation 5 above.

7. Assessment

Assessment will be based on a written examination of 2 to 3-hour duration (normally a paper of 2 hour duration for modules carrying less or equal to 3.5 credits and 3 hour paper for modules carrying four to seven credits) and on continuous assessment done during the semester or year.

Written examinations for all modules, whether taught in semester 1 or in semester 2 or both, will be carried out at the end of the academic year (unless otherwise stated).

The continuous assessment will count for **20% to 30%** of the overall percentage mark of the module(s), except for a Programme where the structure makes for other specific provision(s). Continuous assessment may be based on laboratory work, seminars and/or assignments and **should include at least two (2) assignments/ tests per semester/year per module.**

There will be at least one compulsory class test at the end of semester 1 for all modules taught in semester 1 of the given academic year unless stated otherwise in the Programme Structure.

An overall total of **40%** for combined assessment and written examination components would be required to pass the module, without minimum thresholds within the individual continuous assessment and written examination.

Special examinations (e.g. class tests) will be arranged at the end of semester 1 or semester 2 for exchange students who have registered only for one semester. In case of yearly modules, credits will be assigned on a pro-rata basis.

8. Repeat and Termination of Registration

If the CPA of a student is < 40 for an academic year, s/he will have to repeat the entire academic year, and retake modules as and when offered. However, s/he will not be required, if s/he wishes, to retake modules for which Grade C or above has been obtained.

Students will be allowed to repeat only once over the entire duration of the Programme of Studies.

Registration of a student will be terminated if

(i) the CPA < 40 at the end of an academic year and the student has already repeated one year of study; or

(ii) the maximum duration allowed for completion of the Programme of Studies has been exceeded.

9. List of Modules – BEng (Hons) Chemical and Renewable Energy Engineering

CORE MODULES		**L+P**	**CREDITS**	**EXAM**
BASIC SCIENCES & MATHEMATICS				
MATH 1111(1)	Mathematics 1	D.E.	3	2 hrs
MATH 1211(1)	Mathematics 2	D.E.	3	2 hrs
ENGINEERING CORE				
CHE 1001Y(1)	Chemistry & Basic Chemical Engineering	3+1	7	3 hrs
CHE 1003Y(3)	Applied Thermodynamics	3+1	7	3 hrs
CHE 2001Y(3)	Fluid Mechanics	3+0.5	6.5	3 hrs
CHE 2002Y(3)	Heat & Mass Transfer	3+1	7	3 hrs
CHE 2004Y(3)	Introduction to Env. Engg. & Renewable Energy Technologies	3+0.5	6.5	3 hrs
CHE 3001Y(5)	Unit Operations	3+0.5	6.5	3 hrs
CHE 3100	Industrial Training	-	0	0
CHE 3202(5)	Chemical Process Design	4+0	4	3 hrs
CHE 3204(3)	Design Project 1	1+6	4	0
CHE 3208(5)	Combustion and Incineration	3+1	3.5	2 hrs
CHE 3209(5)	Applied Renewable Energy Technologies	3+1	3.5	2 hrs
CHE 4000Y(5)	Degree Project	-	10	-
CHE 4006Y(5)	Energy Engineering	3+0	6	3 hrs
CHE 4007Y(5)	Energy Management	3+0	6	3 hrs

CHE 4101(5)	Design Project 2	1+8	5	-
CIVE 1101(1)	Engineering Materials	3+1	3.5	2 hrs
CSE 1010e(1)	Introduction to Information Technology	O.E.	3	2 hrs
CSE 1020(1)	Computer Programming	2+2	3	2 hrs
CHE 2003Y(3)	Instrumentation & Chemical Process Control	3+0.5	6.5	3 hrs
MECH 1213(1)	Applied Mechanics	3+1	3.5	2 hrs
HUMANITIES & MANAGEMENT CORE				
COMS 1010(1)	Communication Skills	D.E.	3	2 hrs
ENGINEERING ELECTIVES				
CHE 2005Y(3)	Reaction Engineering	1.5+0.5	3.5	2 hrs
CHE 3210(5)	Chemical Engineering Economics	3+0	3	2 hrs
CHE 4005Y(5)	Quality Systems	1.5+0	3	2 hrs
CHE 4008Y(5)	Chemical Process Safety and Risk Management	1.5+0	3	2 hrs
ELEC 2233(3)	Electrical Energy Systems	2+0	2	2 hrs
MECH 1111(1)	Engineering Graphics 1	2+2	3	0
MECH 4070(5)	Refrigeration and Air Conditioning Engineering	3+0	3	2 hrs
MECH 4163(5)	Operation Research 1	3+0	3	2 hrs
BASIC SCIENCES & MATHEMATICS ELECTIVES				
MATH 1231(1)	Probability & Statistics	D.E.	3	2 hrs
MATH 2101(3)	Mathematics 3	3 +0	3	2 hrs
HUMANITIES & MANAGEMENT ELECTIVES				
ACF 1000(1)	Accounting for Financial Decision Making	3+0	3	2 hrs
ECON 1015(1)	Economics	3+0	3	2 hrs
LAWS 2109(3)	Legal Aspects of Chemical Engineering	3+0	3	2 hrs
MGT 2116(3)	Research Methodology	3+0	3	2 hrs

Note:

- **ENGINEERING ELECTIVES**
  Module MECH 1111(1) will be assessed solely by continuous assessment.

- **CORE MODULE FOR DIPLOMA**
  CHE 2000(3) – Diploma Project

10. Programme Plan – BEng (Hons) Chemical & Renewable Energy Engineering

LEVEL/YEAR 1

YEARLY MODULES

Code	Module Name	L+P	Credits
CORE			
CHE 1001Y(1)	Chemistry & Basic Chemical Engineering	3+1	7
CHE 1003Y(3)	Applied Thermodynamics	3+1	7

SEMESTER MODULES

Code	Module Name	Sem	L+P	Credits
CORE				
MATH 1111(1)	Mathematics 1	1	D.E.	3
MATH 1211(1)	Mathematics 2	2	D.E.	3
CIVE 1101(1)	Engineering Materials	1	3+1	3.5
CSE 1010e(1)	Introduction to IT	1	O.E.	3
COMS 1010(1)	Communication Skills	2	D.E.	3
CSE 1020(1)	Computer Programming	2	2+2	3
MECH 1213(1)	Applied Mechanics	2	3+1	3.5
ELECTIVES				
ECON 1015(1)	Economics	1	3+0	3
MECH 1111(1)	Engineering Graphics I	1	2+2	3
ACF 1000(1)	Acc for Fin Decision Making	2	3+0	3

LEVEL/YEAR 2

YEARLY MODULES				SEMESTER MODULES				
Code	**Module Name**	**L+P**	**Credits**	**Code**	**Module Name**	**Sem**	**L+P**	**Credits**
CORE				**CORE**				
CHE 2001Y(3)	Fluid Mechanics	3+0.5	6.5					
CHE 2002Y(3)	Heat and Mass Transfer	3+1	7					
CHE 2003Y(3)	Inst. & Chemical Process Control	3+0.5	6.5					
CHE 2004Y(3)	Intro to Env. Eng & Renewable Energy Technologies	3+0.5	6.5					
ELECTIVE				**ELECTIVES**				
CHE 2005Y(3)	Reaction Engineering	1.5+0.5	3.5	MATH 2101(3)	Mathematics 3	1	3+0	3
				MATH 1231(1)	Probability & Statistics	2	D.E.	3
				MGT 2116(3)	Research Methodology	2	3+0	3
				LAWS 2109(3)	Legal Aspects of Chemical Engineering	1	3+0	3

LEVEL/YEAR 3

YEARLY MODULE				SEMESTER MODULES				
Code	**Module Name**	**L+P**	**Credits**	**Code**	**Module Name**	**Sem**	**L+P**	**Credits**
CORE				**CORE**				
CHE 3001Y(5)	Unit Operations	3+0.5	6.5	CHE 3100	Industrial Training	1	-	-
				CHE 3202(5)	Chemical Process Design	2	4+0	4
				CHE 3208(5)	Combustion and Incineration	2	3+1	3.5
				CHE 3209(5)	Applied Renewable Energy Technologies	2	3+1	3.5
				CHE 3204(3)	Design Project 1	1	1+6	4
				CHE 4101(5)	Design Project 2	2	1+8	5
				ELECTIVES				
				CHE 3210(5)	Chemical Engineering Economics	2	3+0	3
				ELEC 2233(3)	Electrical Energy Systems	2	2+0	2

LEVEL/YEAR 4

YEARLY MODULES				SEMESTER MODULES				
Code	**Module Name**	**L+P**	**Credits**	**Code**	**Module Name**	**Sem**	**L+P**	**Credits**
CORE		-		**CORE**				
CHE 4000Y(5)	Degree Project		10					
CHE 4006Y(5)	Energy Engineering	3+0	6					
CHE 4007Y(5)	Energy Management	3+0	6					
ELECTIVES				**ELECTIVES**				
CHE 4008Y(5)	Chemical Process Safety and Risk Management	1.5+0	3	MECH 4070(5)	Refrigeration and Air Conditioning Engineering	2	3+0	3
CHE 4005Y(5)	Quality Systems	1.5+0	3	MECH 4163(5)	Operation Research 1	2	3+0	3

11. Outline Syllabus

This outline syllabus is not prescriptive and is intended to serve as a guide only.

Note: Pre-requirement (PQ); Pre-requisite (PR)

ACF 1000(1) - ACCOUNTING FOR FINANCIAL DECISION MAKING
The Role of Accounting Information; Recording and Summarising Transactions; Accounting Concepts & Preparing Final Accounts; Adjustments to Final Accounts; Capital v/s Revenue Expenditure; Bank Reconciliation Statement; Accounting Ratios; Accounting for Internal Decision Making Techniques; Elements of Cost; Costing Methods & Techniques; Decision Making Techniques; Accounting for Manufacturers; Budgets.

CHE 1001Y(1) - CHEMISTRY & BASIC CHEMICAL ENGINEERING

Physical Chemistry; Molecular Structure; Spectroscopy; Non-Electrolyte Solutions; Ionic Equilibria; Organic Chemistry: Structure and Bonding, Stereochemistry, Reaction Mechanisms.

Units and Dimensions; Chemical Equation & Stoichiometry; Properties of Gases; Phase Phenomena; Concept of Equilibrium; Material Balance (Steady state material balances, balances in non-reacting and reacting systems, by-pass, purge and recirculation); Energy Balance (General energy balance, reversible processes, heat of solution).

CHE 1003Y(3) - APPLIED THERMODYNAMICS

Thermodynamics System and Properties of Substances; First and Second Laws and their Applications; Enthalpy and Auxiliary functions; Work, Heat and Power Cycles; Use of Relevant Tables e.g. Steam, Psychometric Charts; Vapour Power Cycles; Rankine Cycle; Superheat and Reheat; Gas Power Cycles; Internal Combustion Engines; Gas Turbine Powerplants; Refrigeration and Heat Pump Systems; 2nd Law of Thermodynamics, Availability Balance for Closed and Open Systems, Second Law Efficiency; Energy and Energy Applications. Advanced Thermodynamics Systems.

CHE 2001Y(3) - FLUID MECHANICS

Fundamental Concepts relating to Fluids; Hydrostatics; Fluids in Equilibrium; Principles of Fluid Motion; Momentum Equation and its Application; Energy Equation and its Application; Flow in Pipelines and Open Channels; Transmission and Losses of Energy in Pipelines; Rotodynamics; Dimensional Analysis and Similarity.

CHE 2002Y(3) - HEAT & MASS TRANSFER

Fundamentals of Heat Transfer; Differential Equations of Heat Transfer; Steady-State Conduction; Convective Heat Transfer; Radiation Heat Transfer; Design of Heat-Exchange Equipment – Heaters, Evaporators; Film Heat Transfer Coefficients; Extended Surface Equipment; Diffusion and Mass Transfer; Fick's Law of Diffusion; Diffusivity and Mechanisms of Mass Transport; Theory of Ordinary Diffusion in Gases; Diffusion through varying cross-sectional area; Diffusion from a Sphere; Molecular Diffusion in Liquids and Solids; Diffusion in Porous Solids; Diffusion with Chemical Reactions.

CHE 2004Y(3) - INTRODUCTION TO ENVIRONMENTAL ENGINEERING & RENEWABLE ENERGY TECHNOLOGY

Introduction to Environmental Engineering; Environmental Protection Act 2002; Criteria and non-criteria air pollutants, dispersion into the atmosphere and engineering control; Current Legislation.

Hydrological cycle; Disposal of domestic wastewater, types, sources, impacts of water pollutants. Standards of Wastewater Discharge into the Environment; Introduction to Wastewater Treatment Systems; Generation of Solid Wastes; Handling, Collection and Disposal; Solid Waste Management; Legal Aspects of Solid Wastes Handling; Energy Sources; Utilisation and Potentials; Fossil Fuels – Solid, Liquid and Gas; Renewable Energy – Hydro Power, Solar, Wind, Biomass, Geothermal, Ocean Thermal, Wave.

CHE 2005Y(3) - REACTION ENGINEERING (PQ: CHE 1001Y(1))

Types of Chemical Reactions; Rate and Order of Reaction; General Mole Balance Equation. Batch and Continuous Reactors; Conversion and Reactor Sizing; Reactors in Series; Rate Laws & Stoichiometry; Stoichiometric Tables for Different Types of Reaction; Reaction with Phase Change; Isothermal Reactor Design; Collection and Analysis of Kinetic Data; Catalytic and Enzyme Reactions.

CHE 3001Y(5) - UNIT OPERATIONS (PQ: CHE 2002Y(3))

Particulate Solids (particle characterisation, particulate solid in bulk); Size Reduction of Solids; Filtration; Membrane Separation Processes (Ultrafiltration, Reverse Osmosis); Centrifugal Separation; Drying; Leaching; Distillation, Gas Absorption; Liquid-Liquid Extraction.

CHE 3100 - INDUSTRIAL TRAINING

Students will be attached to a firm for a period of at least 20 weeks. The objective is to provide the student with the opportunity to apply theoretical knowledge at their industrial placement and to function within the organisational structure of the firm. Students have to perform satisfactorily in this module before qualifying for the award of the degree.

CHE 3210(5) - CHEMICAL ENGINEERING ECONOMICS
Introduction to Chemical Engineering Economics; Critical Path Analysis and PERT Analysis of Projects, Capital Cost Estimation, Cost Index, Manufacturing Cost and Cost of Product, Depreciation; Taxes and Insurance; Break-Even Analysis, Profitability of Project using Ratios, Project Appraisal Techniques: Payback Period, Discounted Cash Flow Method, Net Present Value, Internal Rate of Return**,** Legal Financial Aspects.

CHE 3202(5) - CHEMICAL PROCESS DESIGN
Formulating Balance Problems; Degree of Freedom Analysis; Solution Strategy using D.O.F; Single and Multiunit Configurations; Non-Reacting and Reacting Systems; Sequencing with Complete and Partial Solutions; Strategy for Machine Calculations.

CHE 3204(3) - DESIGN PROJECT 1
Problem definition, Process Consideration, Block Diagram, Mass Balances, Energy Balances, Preliminary Sizing of Equipment & Costing, Control Strategy, Preliminary Hazop, Basis for Detailed Design.

CHE 3208(5) - COMBUSTION AND INCINERATION
Introduction to fuel and combustion. Combustion processes and system enclosures. Energy conversion. Boiler and fired systems. Steam and condensate systems. Incineration systems. Pollution aspects and control.

CHE 3209(5) - APPLIED RENEWABLE ENERGY TECHNOLOGIES
Energy from biomass resources (sugarcane and solid wastes) and conversion processes. Solar energy conversion systems. Wind energy. Ocean energy technologies. Energy storage systems.

CHE 4000Y(5) - DEGREE PROJECT
Project related to Chemical Engineering or Energy and Environmental Engineering.

CHE 4005Y(5) - QUALITY SYSTEMS
Introduction to Quality Management Systems, ISO 9000, Integration of OHSAS 18001 with Quality Systems; Internal Auditing, Problem Solving, Introduction to Statistical Process Control, Quality Control Tools, Sampling Plans, Continuous Improvement, Benchmarking, Total Quality Management.

CHE 4006Y(5) - ENERGY ENGINEERING
Energy technologies. Energy recovery. Conventional and Emerging technologies for energy production and conservation. Total Energy Schemes. Pinch technology. Energy. Fluidisation. LCA analysis. Energy from wood, agricultural wastes and municipal solid waste. Biomass conversion technologies such as biomass gasification, ethanol production, biogas recovery from sludge and wastes, biomass based power generation, environmental impacts of biomass energy production and consumption.

CHE 4007Y(5) - ENERGY MANAGEMENT
Principles of energy management. Process modifications and waste minimisation techniques for cleaner production. Energy auditing and management. Supply & demand side management. Energy conservation in chemical and process plants. Environmental aspects of energy and pollution control. Transport energy. Energy economics. Energy-economy-environment linkage. Power sector. Energy policy and planning.

CHE 4008Y(5) - CHEMICAL PROCESS SAFETY AND RISK MANAGEMENT
Principles of Toxicity and Toxicokinetics; Hazard Analysis - Identification and Evaluation; HazOp – Operability study for energy processes; Risk Assessment - Exposure Assessment and Quantification of Risk; Risk Evaluation - risk comparison, risk perception, risk and hazard communication, economic analyses, regulatory limits, emerging priorities in risk assessment; Risk Reduction Measures and Regulatory Approaches : APELL and TransAPELL frameworks.

CHE 4101(5) - DESIGN PROJECT 2
Redefining Basis for Detailed Design; Material & Energy Balances; Detailed Design of at least 2 Major Equipment; Detailed Hazop and Instrumentation around a major Unit operation; Detailed PFD and PID; Equipment Schedule; Costing.

CIVE 1101(1) - ENGINEERING MATERIALS
Properties of Materials - Hydraulic and Bituminous Binders; Plastics; Glass; Ceramics and Composite Materials; Materials Science - Crystal Structure; Plastic Deformation; Properties and Behaviour of Materials.

COMS 1010(1) - COMMUNICATION SKILLS
Writing skills, non-verbal communication, modes of speech delivery and presentation aids, speeches, perception and listening skills, business and technical writing.

CSE 1010e(1) - INTRODUCTION TO INFORMATION TECHNOLOGY
IT and Computers; Stepping in the Computer; Input and Output Devices; Secondary Storage; Programming; Systems Software; Applications Software; Systems Development; Computer Networks; The internet; Computer Security; Software Utilities; Issues and Trends in IT.

CSE 1020(1) - COMPUTER PROGRAMMING
Basic types; arithmetic & logical operators and expressions; decision and loop structures; arrays (one-dimensional and two-dimensional); functions; value and reference parameters. Files: creation, opening, writing, closing; introduction to structures data types.

ECON 1015(1) - ECONOMICS
Microeconomics: Economics and the Economy; Demand, Supply and the Market; Elasticity Concept; Theory of Consumer Choice; Theory of Supply: Costs and Production; Market Structure; Labour Market; Introduction to Welfare Economics.
Macroeconomics: Introduction, National Income Accounting; Determination of National Income Equilibrium; Aggregate Demand; Fiscal Policy and Foreign Trade; Money and Banking; Monetary and Fiscal Policy; Unemployment; Inflation; Economic Growth.

CHE 2003Y(3) - INSTRUMENTATION AND CHEMICAL PROCESS CONTROL
Temperature, Pressure, Flow and Level Measurements; Process Instrumentation Diagrams, Control of a Chemical Process: its characteristics and associated problems; Mathematical Modelling of the Chemical Processes; Analysis of Dynamic Behaviour; Feed-Forward and Feedback Control.

ELEC 2233(3) - ELECTRICAL ENERGY SYSTEMS
Electrical Energy Demand, Power Plant Economics, Thermal Power Stations, Hydro-Electric Power Stations, Diesel Electric Power Stations, Gas Turbine Plants, Introduction to Transmission and Distribution, Introduction to Switchgear and Protection.

LAWS 2109(3) - LEGAL ASPECTS OF CHEMICAL ENGINEERING
Introduction to law – Contract: General principles, Consideration of some specific contracts relating to Chemical and Renewable Energy Engineering – Tort – Intellectual Property Law: Overview of intellectual property rights, Patent – Environmental Law: General principles – Specific laws: Occupational Safety & Health Act, Dangerous Chemicals Control Act, Dangerous Drugs Act.

MATH 1111(1) - MATHEMATICS 1 (PR: A-Level Mathematics)
Calculus of one and several variables; Polar Coordinates; Complex Numbers; Hyperbolic Functions; Limits; Ordinary Differential Equations.

MATH 1211(1) - MATHEMATICS 2 (PR: A-Level Mathematics)
Matrix Algebra: Matrices and Determinants; Solution of Linear Systems of Equations; Eigenvalues and Eigenvectors; Infinite Series: Comparison test and ratio test for non-negative series; Vector Algabra: Scalar and Vector Products, Triple Products; Vector Equations; Vector Analysis: Gradient, Divergence and Curl; Line and Multiple Integrals; Green's Theorem in the Plane; Divergence Theorem and Stoke's Theorem.

MATH 1231(1) - PROBABILITY & STATISTICS
Elementary Probability; Conditional Probability; Discrete and Continuous Distributions; The Central Limit Theorem; Introduction to Linear Regression; Estimation and Hypothesis Testing.

MATH 2101(3) - MATHEMATICS 3
Complex variables. Laplace and Fourier Transforms. Fourier series. Numerical solutions of differential equations.

MECH 1111(1) - ENGINEERING GRAPHICS I
Introduction to Drawing Office Practice, BS 308, etc; Geometrical constructions**;** Introduction to Development (Prisms, cylinders, etc); Orthographic Projection (systems of projection); Dimensioning and Tolerancing; Sections and Sectional Views; Isometric projection; Standard Parts (Threading, Fasteners, etc); Introduction to Assembly Drawing.
Computer Aided Drafting: Introduction to the AutoCAD Window Environment, Basic Drawing & Editing Commands, Layers, Blocks, Managing Object Properties, Plotting, etc.

MECH 1213(1) - APPLIED MECHANICS
Statics; Dynamics; Friction; Work Power and Energy; Direct Stress and Strain; Shear and Torsion; Shear Force and Bending Moment.

MECH 4070(5) - REFRIGERATION AND AIR CONDITIONING ENGINEERING
Refrigeration, P-h, T-S, P-v charts, Vapour Compression Cycle and System Analysis, Factors affecting the performance of refrigeration systems. Commercial and industrial Refrigeration, Equipment: Compressors, Evaporators, Condensers, Throttle Valves, Refrigerant and the Ozone Layer.
Air Conditioning (Emphasis on tropical countries); Comfort and Industrial, The Psychometric Chart, The Need for Heating, Cooling, humidifying, dehumidifying, and Other Related Processes, Ventilation, Indoor Air quality and Standards, Determination of Heating and Cooling Load, Air Conditioning Systems. Solar energy heating and cooling, Conservation of Energy, Maintenance of Equipment, Energy Management and Control, Running Costs, Combined Heat and Power, Thermal Storage Systems; Partial and Full.

MECH 4163(5) - OPERATION RESEARCH 1
Linear Programming Techniques; Forecasting Techniques; Decision & Utility; Theory; Advanced Inventory Model; JIT Systems; Scheduling of Manufacturing & Service Systems; Queuing Theory; Network Models.

MGT 2116(3) - RESEARCH METHODOLOGY
The Research Process; The need for information; problem definition; Establishing research objectives; Research design; Causal research; Experimental design; Information types and sources; Data collection methods; Data collection forms; Measurement and scaling; Sampling; Data coding, editing and analysis; Hands-on with SPSS; Writing of report.
Problem and Hypotheses Formulation, Research Design, Data Collection Method, Data Collection Forms, Sample Design, Analysis and Interpretation of Data, Use of SPSS, Research Report.

January 2010