

Sc.8 SYLLABI

Sc.8.1. SYLLABI FOR BSC, BSC(AGRIC), BINSTAGRAR AND BCONS.SC.

List of codes:

Fak_Dept:		The faculty in which the time-table for the particular course is determined and the department that presents the course.
NAS_BCM of Biochemistry	=	Faculty of Natural and Agricultural Sciences_Department
NAS_BOT	=	Faculty of Natural and Agricultural Sciences_Department of Botany
NAS_CMY	=	Faculty of Natural and Agricultural Sciences_Department Chemistry
NAS_COS	=	Faculty of Natural and Agricultural Sciences_Department Computerscience
NAS_FLG	=	Faculty of Natural and Agricultural Sciences_Department of Physiology
NAS_FSK	=	Faculty of Natural and Agricultural Sciences_Department of Physics
NAS_GGY	=	Faculty of Natural and Agricultural Sciences_Department of Geography, Geoinformatics and Meteorology
NAS_GLY	=	Faculty of Natural and Agricultural Sciences_Department of Geology
NAS_GTS	=	Faculty of Natural and Agricultural Sciences_Department of Genetics
NAS_LEK	=	Faculty of Natural and Agricultural Sciences_Department of Agricultural Economics, Extension and Rural Development
NAS_MBY	=	Faculty of Natural and Agricultural Sciences_Department of Microbiology and Plant Pathology
NAS_PGW	=	Faculty of Natural and Agricultural Sciences_Department of Plant Production and Soil Sciences
NAS_SCI	=	Faculty of Natural and Agricultural Sciences_Gold Fields Computer Centre for Education
NAS_VBR	=	Faculty of Natural and Agricultural Sciences_Department of Consumer Science
NAS_VDW	=	Faculty of Natural and Agricultural Sciences_Department of Food Science
NAS_VKU	=	Faculty of Natural and Agricultural Sciences_Department of Animal and Wildlife Sciences
NAS_VWT	=	Faculty of Natural and Agricultural Sciences_Department of Insurance and Actuarial Sciences
NAS_WST	=	Faculty of Natural and Agricultural Sciences_Department of Statistics
NAS_WTW	=	Faculty of Natural and Agricultural Sciences_Department of Mathematics and Applied Mathematics

NAS_ZEN	=	Faculty of Natural and Agricultural Sciences_Department of Zoology and Entomology
EB_BDO	=	Faculty of Economic and Management Sciences_Department of Human Resource Management
EB_BEM	=	Faculty of Economic and Management Sciences_Department of Marketing and Communications Management
EB_EKN	=	Faculty of Economic and Management Sciences_Department of Economics
EB_FRK	=	Faculty of Economic and Management Sciences_Department of Accounting and Financial Mangement
EB_INF	=	Faculty of Economic and Management Sciences_Department of Informatics
EB_OBS	=	Faculty of Economic and Management Sciences_Department of Business Management
EB_TBE	=	Faculty of Economic and Management Sciences_Department of Tourism Management
GW_EOT	=	Faculty of Humanities_Unit for the Development of Language Skills
GW_FLG	=	Faculty of Humanities_Department of Physiology
GW_KGK	=	Faculty of Humanities_Department of Visual Arts
GW_SLK	=	Faculty of Humanities_Department of Psychology
GW_SOC	=	Faculty of Humanities_Department of Sociology
GW_VKK	=	Faculty of Humanities_Department of Visual Arts
ING_CIR	=	Faculty of Engineering, Built Environment and Information Technology_Department of Chemical Engineering
ING_IGB	=	Faculty of Engineering, Built Environment and Information Technology_Department of Engineering Management
ING_LBI	=	Faculty of Engineering, Built Environment and Information Technology_Department of Civil and Biosystems Engineering
ING_MIT	=	Faculty of Engineering, Built Environment and Information Technology_Department of Mechanical and Aeronautical Engineering
ING_SWK	=	Faculty of Engineering, Built Environment and Information Technology_Department of Civil and Biosystems Engineering
MED_ANA	=	Faculty of Health Sciences_Department of Anatomy
MED_FAR	=	Faculty of Health Sciences_Department of Pharmacology
OPV_OPV	=	Faculty of Education_Faculty of Education
RGL_RGL	=	Faculty of Law_Faculty of Law
DML_DML	=	Damelin_Damelin

Language: Medium of instruction of the course

English: Medium of instruction is English.

Afrikaans: Medium of instruction is Afrikaans.

Double: Separate classes for Afrikaans and English.

Dual medium: Both Afrikaans and English are used in the class.

lpw/ppw: lectures per week/ practicals per week (e.g.: 3+1 = 3 lectures and 1 practical per week)

Term: The term in which the specific course/module is presented.

J1 = the whole year (year course: extends over two semesters)

S1 = the first semester (K1 + K2); S2 = the second semester (K3 + K4)

K1 = first quarter; K2 = second quarter; K3 = third quarter; K4 = fourth quarter

Credits: Credit value of a course/module.

: This symbol implies a course must be taken either before or concurrent with the course for which it is a prerequisite.

TDH: Approval from the head of department is required to register for the course.

Par 1.2 and Par 2.2 : Refers to the requirements for specific courses that appear at the beginning of this publication.

Module	Title				
Fac_Dept	Old code	Language	lpw/ppw	Term	Credits
ABR351	LABOUR LAW 351				
RGL_RGL	n a	Bilingual	3 + 0	K1	10
Basic principles of the employment contract. Collective Labour Law.					
ABR352	LABOUR LAW 352				
RGL_RGL	n a	Bilingual	3 + 0	K2	10
Statutory conditions of employment. Individual labour disputes. Collective labour disputes. Settlement procedures. Social security provisions.					
ABV361	LABOUR RELATIONS 361				
RGL_RGL	n a	Bilingual	3 + 0	K3	10
The theoretical basis of Labour Relations. In this module the basic concepts, historical context and theoretical approaches to the field of Labour Relations will be discussed. The institutional framework in which labour relations operates, will be addressed with particular emphasis on the structural mechanisms and institutional processes. The service relationship which forms the basis of labour relations practices, will also be analysed.					
ABV362	LABOUR RELATIONS 362				
RGL_RGL	n a	Bilingual	3 + 0	K4	10
Labour Relations Practice. In this module students are taught the conceptual and practical skills related to practice aspects such as grievance handling, disciplining, retrenchments, collective bargaining, industrial action and dispute resolution.					
AGC161	INTRODUCTION TO AGRICULTURE 161				
NAS_PGW	AGC152	English	3 + 1	K3	8
Basic properties of soils and principles involved in plant nutrition and plant health. The most important agronomic, horticultural, pasture and fodder crops in South Africa and their cultivation. General principles of animal breeding, animal reproduction and extensive animal production systems. Nutrient requirements of ruminants and monogastric animals. Post-harvest technology of food production and food processing.					
AGR351	PRIMARY FOOD CROPS 351				
NAS_PGW	AGR313	Bilingual	2 + 0.5	K1	7
Botanical characteristics, classification, growth requirements, production practices and utilization of important food crops, such as potato, grain and leguminous crops. Visits to research institutions and producers.					
Prerequisites: [HSC252] and [PPK251]					

AGR352	VEGETABLE PRODUCTION 352				
NAS_PGW	AGR313	Bilingual	2 + 0.5	K2	7
Botanical characteristics, classification, growth requirements, production practices and utilization of vegetables in the field and in a controlled environment. Visits to fresh produce markets, seed and chemical companies and growers.					
Prerequisites: [HSC252] and [PPK251]					
AGR361	INDUSTRIAL CROPS 361				
NAS_PGW	AGR323	Bilingual	2 + 0.5	K3	7
Botanical characteristics, classification, growth requirements, production practices and utilization of crops rich in oil and protein, fibre crops, tobacco, sugarcane and diverse crops. Visits to research institutions and producers.					
Prerequisites: [HSC252] and [PPK251]					
AGR450	PRODUCTION SYSTEMS I: GRAIN CROPS 450				
NAS_PGW	AGR481	English	2 + 0.5	S1	6
Integration of agronomic, pedological, botanical, economic and management considerations in crop production systems with a view to sustainable maximum economic yield. Case studies of specific crops.					
AGR460	PRODUCTION SYSTEMS II: VEGETABLE CROPS 460				
NAS_PGW	AGR482	English	2 + 0.5	S2	6
Integration of agronomic, pedological, botanical, economic and management considerations in crop production systems with a view to sustainable maximum economic yield. Case studies of specific vegetable crops.					
AGV410	AGRARIAN EXTENSION 410				
NAS_LEK	n a	Bilingual	2 + 0	S1	20
The objective, philosophy and ethics of extension. Technology and agricultural production. Distribution and diffusion of technology. Group dynamics, the functioning and handling of groups. Leadership, leadership functions and types. Extension organisation.					
AGV412	GROUP DYNAMICS, LEADERSHIP AND COMMUNITY FACILITATION 412				
NAS_LEK	n a	English	3 + 0	S1	20
Community – concept and meaning; the community and change; hindrances to change. The use of small groups in the community; group dynamics; group and community goals. The paradigm shift from directing to facilitating; group techniques; participative techniques. Leadership development in communities. Case studies.					
AGV413	COMMUNICATION 413				
NAS_LEK	n a	English	2 + 0	J1	20
Nature and importance of development communication; the process and models of communication; critical elements and factors in communication; symbol systems and non-verbal communication. Credibility messages and message treatment; audience and audience identification. Effective listening and feedback. Practical training in communication: Effective speaking; visual aids in communication; managing conflict; report writing.					
AGV415	PRINCIPLES AND APPROACHES OF DEVELOPMENT AND EXTENSION 415				
NAS_LEK	n a	English	2 + 0	J1	20
The role, importance and nature of extension and development. International approaches; paradigm shifts. The Third World: concept, characteristics and change. The subsistence farmer, rural poverty and the deprivation trap. Development practice theories. Participation; appropriate technology; role players and responsibilities in development.					

AGV421	COMMUNICATION 421				
NAS_LEK	n a	Bilingual	2 + 0	S2	20
Communication: Definition and clarification of concepts. Theory and elements of communication. Verbal and non-verbal communication. Determinants of interpersonal communication. Abating factors impeding communication. Nature, classification and efficiency of communication channels.					
AGV426	PROGRAMME AND PROJECT PLANNING 426				
NAS_LEK	n a	English	2 + 0	J1	20
Nature, purpose and principles of a programmed and purposeful approach. Institutional framework for community participation, ownership and empowerment; linking with complementary and support services. Participative need appraisal, problem identification and delimitation; PRA methods and techniques; problem conceptualisation and development of survey instrument; situation surveys and analyses; formulation of objectives; identification and scheduling of methods and activities; work plan or calendar construction, budgeting.					
AGV428	EVALUATION OF DEVELOPMENT AND DEVELOPMENT PROJECTS 428				
NAS_LEK	n a	English	3 + 0	S2	20
Reasons and purposes of evaluation; expectations from evaluations. Criteria and indicators of development, development projects and development organisations. Methods of evaluation; formulation of objectives and scale construction for evaluation; developing and coding the measuring instrument. Sampling and sampling techniques; data analysis and interpretation; evaluation report.					
AGV429	BEHAVIOUR CHANGE AND INTERVENTION 429				
NAS_LEK	n a	English	2 + 0	J1	20
Characteristics of human behaviour; basic concepts: perception, defence mechanism, decision making and problemsolving, learning, innovativeness and adoption behaviour; diffusion of innovations: elements and phases of diffusion, opinion leaders and influential persons, methodological implications for extension. Psychological, cultural and social barriers to change. Behaviour change or modification: comparison of different approaches. A practical model: background principles and theories, identifying "forces" or behaviour determinants; designing effective extension messages for development programmes.					
AGV481	PHILOSOPHY, ORGANISATION AND MANAGEMENT OF EXTENSION 481				
NAS_LEK	n a	English	4 + 0	S1	20
The history of agricultural extension; phases of development, extension in other countries; nature, philosophy and objectives of extension; ethics in extension; models of organisations; personnel management; administration; seminar.					
AGV482	LEADERSHIP AND GROUP DYNAMICS 482				
NAS_LEK	n a	English	4 + 0	S1	20
The group as channel and instrument in extension; definitions and characteristics; group formation; theories of group functioning; internal and external group dynamics; group techniques and evaluation; rural groups and their application; definitions and theories of leadership; types, kinds and functions of leadership; the extension officer as professional leader; opinion leadership; training of leaders; seminar.					
AGV485	COMMUNITY EXTENSION AND DEVELOPMENT 485				
NAS_LEK	n a	English	3 + 1	S1	20
The relation between rural sociology, community development and extension; physical and social structures of communities; cultural and value systems; social stratification; development as change; process and ethical norms; principles and functions of community development; development obstructions; method and models.					

AGV487	EXTENSION PROGRAMMING 487				
NAS_LEK	n a	English	2 + 1	J1	20
Definitions, concepts and models; philosophy principles and assumptions, motives and tenets; institutional linkages with and participation of communities; reconnaissance surveys, problem identification and delineation; problem conceptualisation, questionnaire construction, planning and analysis of surveys, formulation of objectives, identification of activities and activity planning, development of work calendar and planning of evaluation.					
AGV488	EVALUATION OF EXTENSION 488				
NAS_LEK	n a	English	2 + 0	J1	20
Meaning, extent and place of evaluation in extension; characteristics of a science (extension science); extension science; the process of research and evaluation; problem identification; theory and hypothesis; objectives; literature research and sources of information; sampling; methods and collection of data; criteria of efficiency; quality of measuring instruments; construction of scales; interviewing; statistical methods; research reporting; computer programming; practical exercises.					
AGV489	ADOPTION AND DIFFUSION 489				
NAS_LEK	n a	English	4 + 0	S2	20
The nature and purpose of extension; definitions; psychological foundations and dynamics of human behaviour; theories and models of decision-making and change in conduct; the field theory, theory and practice; characteristics and acceptance of innovations, factors determining behaviour, categories of acceptance. Diffusion: clarification of concepts; deficiencies of empirical research; seminar.					
AKM702	FINANCIAL MATHEMATICS 702				
NAS_VWT	AKW700	English	1 + 0	J1	24
Generalised cash-flow model. The time value of money. Interest rates. Discounting and accumulating. Compound interest functions. Equations of value. Loan schedules. Project appraisal. Investments. Simple compound interest problems. The "No Arbitrage" assumption and forward contracts. Term structure of interest rates. Stochastic interest rate models.					
Prerequisite: [IAS251]					
AKM704	SURVIVAL MODELS 704				
NAS_VWT	AKW701	Bilingual	1 + 0	J1	24
Overview. Survival models and the life table. Estimating the lifetime distribution $F_x(t)$. The Cox regression model. The two-state Markov model. The general Markov model. Binomial and Poisson models. Graduation and statistical tests. Methods of graduation. Exposed to risk. The evaluation of assurances and annuities. Premiums and reserves.					
AKM705	ACTUARIAL MATHEMATICS 705				
NAS_VWT	AKW701	Bilingual	1 + 0	J1	24
Annuities and assurances involving two lives. Definitions, estimation and use of select mortality functions. Variable benefit, disability, long-term care contracts. Life insurance contracts: expenses and bonuses. Gross premiums and reserves for fixed and variable benefit contracts. Discounted emerging cost techniques. Asset shares for life insurance contracts. Alterations to contracts. Costs of guarantees under life insurance contracts. Factors affecting mortality, selection, standardisation. The process of population projection and its main determinants. Valuation of benefits under a disability insurance contract.					
ANA126	BASIC HUMAN HISTOLOGY 126				
MED_ANA	n a	Bilingual	1 + 1	S2	12
General introduction to cells and tissue: terminology, the cell and cytoplasm, organelles and inclusions, surface and glandular epithelium, general connective tissue, specialised connective tissue, namely cartilage, bone, blood and haemopoietic tissue, muscle and nervous tissue.					

ANA226	HUMAN HISTOLOGY 226				
MED_ANA	n a	Bilingual	1 + 1	S2	10
General introduction to organ structure. Terminology. The eye, ear, skin, circulatory system, nervous system, lymphoid system, gastrointestinal tract, gastrointestinal tract glands, respiratory system, urinary system, andrological and female reproductive systems, endocrine system.					
ANA316	HISTOLOGY TECHNIQUES 316				
MED_ANA	n a	Bilingual	2 + 2	S1	15
General introduction to light and electron microscopic techniques: fixation, processing, imbedding, staining. Principles of different staining techniques for LM and EM: routine stains, proteins, carbohydrates, amino acids, metachromasia, immunocytochemistry, lectin stains, specialised stains. Principles of the operation of LM and EM: general LM, fluorescent microscopy, transmission and scanning electron microscopy.					
APS461	CROP PHYSIOLOGY 461				
NAS_PGW	PPK411	English	3 + 0.5	K3	8
Physiology of growth, yield and quality; effect of environmental factors upon plant carbon budget, stress physiology. Growth manipulation. Growth analysis and modelling. Prerequisites: [GKD250] and [GKD260] and [HSC252] and [HSC261] and [PGW352]					
APZ221	ANIMAL PRODUCTION PHYSIOLOGY 221				
NAS_VKU	n a	English	3 + 0.5	S2	12
The physiological adaptation mechanisms of the animal and his response to the environment, heat and cold tolerance, social stress, introduction to immunology, digestion of food and absorption of nutrition materials.					
APZ311	LIVESTOCK BREEDING 311				
NAS_VKU	n a	English	2 + 0.5	S1	10
Theory of population and quantitative genetics. Gene function and expression. Mendelian heredity. Gene frequencies. Qualitative hereditary characteristics in livestock. Prerequisite: [TDH]					
APZ312	ANIMAL PRODUCTION PHYSIOLOGY 312				
NAS_VKU	n a	English	2 + 0.5	S1	10
Reproduction physiology, oogenesis, the oestrous cycle, female fertility, environmental stimuli and synchronizing mechanisms, spermatogenesis, male fertility, functional fertility, venereal diseases and control, AI, transfer of embryo and growth. Prerequisite: [APZ221] or [TDH]					
APZ313	LIVESTOCK NUTRITION 313				
NAS_VKU	n a	English	4 + 0.5	S1	14
Nutritional needs of ruminant and monogastric livestock according to type and physiological status, quality control of fodder, symptoms of nutritional deficits. <i>Capita selecta</i> : (A) Monogastric application (2 l.p.w. + ¼ p.), (B) Ruminant application (2 l.p.w. + ¼ p.). Prerequisite: [APZ221] or [TDH]					
APZ321	LIVESTOCK PRODUCTS 321				
NAS_VKU	n a	English	2 + 0	S2	10
Quality parameters and factors which influence the quality of meat, wool, hair, milk and eggs, including possible risks to human health. Prerequisite: [TDH]					
APZ324	LIVESTOCK NUTRITION 324				
NAS_VKU	n a	English	4 + 0.5	S2	14
Applied nutrition and nutritional management in different production systems. Ration formulation. Feeds and feed additives. Prerequisites: [APZ221] and [APZ313] or [TDH]					

APZ325	LIVESTOCK BREEDING 325				
NAS_VKU	n a	English	2 + 0	S2	10
General principles in breeding of livestock (cattle, small stock and pigs). Heredity and race improvement. Selection and mating systems. National livestock improvement schemes. Prerequisite: [APZ311] or [TDH]					
APZ400	SEMINAR 400				
NAS_VKU	n a	English	1 + 0	J1	8
Literature studies and seminars on the management of Animal Production Systems. Prerequisites: [APZ311] and [APZ312] and [APZ313] and [APZ321] and [APZ324] and [APZ325] and [TDH]					
APZ412	LIVESTOCK ECOLOGY 412				
NAS_VKU	n a	English	3 + 1	S1	16
Interaction between livestock and the environment: specific adaptation mechanisms and management of resources to optimize biological efficiency. Selected literature study and discussion classes. Prerequisite: [APZ324] or [TDH]					
APZ422	LIVESTOCK MANAGEMENT 422				
NAS_VKU	n a	English	3 + 1	S2	16
Functional drive in beef and dairy cattle, sheep and goats. Management programmes and intensive, extensive production systems. Seminars, discussions and literature studies on animal nutrition, breeding, production, planning and management systems and marketing. Prerequisites: [APZ324] and [APZ325] and [TDH]					
APZ423	LIVESTOCK MANAGEMENT 423				
NAS_VKU	n a	English	3 + 1	S2	16
Functional management of pigs, poultry and aquaculture. Management programmes and production systems, seminars, discussions and literature studies on animal nutrition, breeding, production, planning and management systems and marketing. Prerequisites: [APZ324] and [APZ325] and [TDH]					
ARD400	RURAL DEVELOPMENT 400				
NAS_LEK	n a	English	2 + 0	J1	40
Overview of the concepts and theories of rural development; the role of agriculture in rural development. Rural livelihood systems: household farming systems; decisions and the operation of farming systems; Non-farm enterprises and SMMEs in rural development; household food security. Rural institutions: Definitions and role of institutions; land tenure; rural financial markets; local institutional development; human capital, knowledge systems. Methodologies for Rural Development: The farming systems approach; participatory techniques; Assessment of land use patterns (zoning techniques); typology techniques; technology transfer and decisionmaking support; communication for rural development; planning rural development at local level.					
ARD482	RESOURCES AND DEVELOPMENT 482				
NAS_LEK	n a	English	3 + 0	S1	20
Review of the most important physical-biological agricultural resources – soil, water, climate, topography, plant species, animal species; differences in characteristics, quality and vulnerability; the concept of optimum land use; resource conservation; general ecological principles; examples of problems caused by mismatching of physical-biological resources and land use during development planning; principles of sensible technology transfer.					
BCM251	INTRODUCTION TO PROTEINS AND ENZYMES 251				
NAS_BCM	BCM216	Bilingual	4 + 1	K1	12
Structural and ionic properties of amino acids. Peptides, the peptide bond, primary, secondary, tertiary and quaternary structure of proteins. Interactions that stabilize protein					

structure, denaturation and renaturation of proteins. Introduction to methods for the purification of proteins, amino acid composition, and sequence determinations. Introduction to enzyme kinetics and enzyme inhibition. Allosteric enzymes, regulation of enzyme activity, active centres and mechanisms of enzyme catalysis. Examples of industrial applications of enzymes.					
Prerequisites: [CMY117] and [CMY127] and [MLB111 GS]					
BCM252	CARBOHYDRATE METABOLISM 252				
NAS_BCM	BCM217	Bilingual	4 + 1	K2	12
Biochemistry of carbohydrates. Thermodynamics and bioenergetics. Glycolysis, citric acid cycle and electron transport. Glycogen metabolism, pentose-phosphate pathway, gluconeogenesis and photosynthesis.					
Prerequisites: [CMY117] and [CMY127] and [MLB111 GS]					
BCM261	LIPID AND NITROGEN METABOLISM 261				
NAS_BCM	BCM226	Bilingual	4 + 1	K3	12
Biochemistry of lipids, membrane structure, anabolism, catabolism of lipids. Nitrogen metabolism, amino acid biosynthesis and catabolism. Biosynthesis of neurotransmitters, pigments, hormones and nucleotides from amino acids. Catabolism of purines and pyrimidines. Therapeutic agents directed against nucleotide metabolism. Examples of inborn errors of metabolism of nitrogen-containing compounds. The urea cycle, nitrogen excretion. Prerequisites: [CMY117] and [CMY127] and [MLB111 GS]					
BCM262	BIOCHEMISTRY IN PERSPECTIVE 262				
NAS_BCM	BCM227	Bilingual	4 + 1	K4	12
Integration of metabolic pathways; biochemistry and nutrition; hormones and second messengers; hormonal control in metabolism; a case study in connectivity among metabolic pathways, nutrition, regulation and the immune system.					
Prerequisites: [CMY117] and [CMY127] and [MLB111 GS]					
BCM271	BIOCHEMISTRY PRACTICAL 271				
NAS_BCM	BCM228	Bilingual	0 + 1	J1	12
(Note: only for students majoring in Biochemistry) Basic biochemical separation methods, experimental design, biochemical calculations.					
Prerequisites: [BCM251 #] and [BCM252 #] and [BCM261 #] and [BCM262 #] and [CMY283 #] and [CMY284 #]					
BCM351	BIOCHEMISTRY OF PROTEINS 351				
NAS_BCM	BCM312	Bilingual	2 + 1	K1	9
Biochemistry of amino acids, peptides and proteins. Chemical modification of amino acids. Primary, secondary, tertiary and quaternary structure, protein folding, sequence motifs and domains, supersecondary and supramolecular structure, self assembly. Practical: Subcellular fractionation (CBE) and purification of proteins. HPLC of proteins (CBE). Dipeptide sequencing and electrophoresis of proteins.					
Prerequisite: [BCM251]					
BCM352	PROTEOME ANALYSIS 352				
NAS_BCM	BCM312	Bilingual	2 + 1	K1	9
Analysis of amino acid composition and sequence of proteins. Introduction to proteomics. Sequence-based characterisation of proteins, scoring matrices and algorithms. Basic techniques for three-dimensional modeling and characterization. Practical: Introduction to bioinformatics in protein structure-function investigations.					
Prerequisite: [BCM251]					
BCM353	ENZYMOLGY 353				
NAS_BCM	BCM321	English	2 + 1	K2	9
Nomenclature: enzyme nomenclature and classification. Specificity and mechanisms: the active site, mechanisms of catalysis and examples of specific enzyme mechanisms eg					

lysozyme and carboxypeptidase A. Enzyme kinetics: derivation of Michaelis-Menten (MM) equation by equilibrium and steady state assumptions, significance of Km and Vmax in the catalytic efficiency of enzymes and linear transformations of the MM equation. Enzyme inhibition: competitive, uncompetitive, non-competitive and irreversible inhibitors with examples of specific toxins and drugs. Multi-substrates: Cleland nomenclature and multi-substrate reactions. Allosteric enzymes: models by Koshland, Hill and Monod. Problems and answers: tutorials of problems and answers based on above concepts. Practicals: isolation of an enzyme, determination of pH and temperature optimum, determination of Km and Vmax, enzyme activation, enzyme inhibition, purification table and final report, oral defense of report.

Prerequisite: [BCM251]

BCM354 BIOCHEMISTRY OF NUCLEIC ACIDS 354

NAS_BCM	BCM424	English	2 + 1	K2	9
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Biochemistry of nucleic acids, nucleotides and nitrogen bases. Chemical modification of nucleotides and nucleic acids. Primary, secondary and tertiary structure of nucleic acids and sequence induced conformational types. Sequence-based analysis and comparison, characterisation of functional regions and genome analysis. Hybridization of nucleic acid strands, thermodynamics and kinetics of the process. Reversible interactions between small ligands (dyes and antibiotics) and nucleic acids. Enzymology of gene manipulation. Principles of the Polymerase Chain Reaction (PCR). Nucleotide sequence determination of nucleic acids. Chemical synthesis and use of oligonucleotides. Note. The practical is shared with Depts Microbiology and Genetics.

Prerequisites: [BCM251] and [BCM252] and [BCM261] and [BCM262]

BCM361 IMMUNOBIOCHEMISTRY 361

NAS_BCM	BCM423	English	2 + 1	S2	18
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Adaptive and innate immunity. Complement. Organs and cells of the immune response. Synthesis and sorting of plasma membrane, secretory and lysosomal proteins. Cell killing: Phagocytosis, apoptosis and necrosis. Ontogeny (development) of the immune response. Biosynthesis of immunoglobulins and T-cell antigen receptors. Interactions between antibody and antigens: Quantitative and qualitative properties. Interactions between cells of the immune response: Presentation and recognition of antigen. Control of the immune response. Chemical and cellular techniques of immunology. Practical: Working with experimental animals: the synthesis of a hapten-protein conjugate, immunisation, bleeding for serum production and an immuno-assay.

Prerequisites: [BCM251] and [BCM252] and [BCM261] and [BCM262] and [BCM351 GS is recommended] and [BCM352 GS is recommended] and [BCM354 GS is recommended]

BCM362 NUTRITIONAL BIOCHEMISTRY 362

NAS_BCM	BCM413	English	1 + 0	K3	4
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Proximate analysis of nutrients. Review of energy requirements and expenditure. Metabolism of energy-yielding nutrients. Requirements and function of water, vitamins and minerals. Interpretation and modification of RDA values for specific diets, eg growth, exercise, pregnancy and lactation, aging and starvation. Comparison of monogastric and ruminant species. Significance of the composition of the carbohydrates eg monosaccharides and disaccharides compared to fiber. Composition of triglycerides, fatty acids and arteriosclerosis. Cholesterol, polyunsaturated, essential fatty acids and dietary anti-oxidants. Essential amino acids and protein quality, nitrogen balance and determination of amino acid requirements. Interactions between nutrients. Biochemical functions of water and fat-soluble vitamins, hypo- and hypervitaminosis and assessment of vitamin status. Mineral requirements, biochemical function, deficiency and overload, imbalances, diarrhea and vomiting. Minerals in redox reactions and dietary antioxidants.

BCM363	XENO BIOCHEMISTRY 363				
NAS_BCM	BCM421	English	1 + 0	K3	5
Metabolism of xenobiotics: absorption, distribution and excretion; oxidation/reduction (Phase I), conjugations (Phase II), export from cells (Phase III); factors affecting metabolism and disposition. Toxic responses: tissue damage and physiological effects; teratogenesis, immunotoxicity, mutagenesis and carcinogenesis. Examples of toxins: biochemical mechanisms of common toxins and their antidotes. Food toxicology: natural toxins in animal, plant and fungal products. Ecological biochemistry: flower pollination, plant defence and animal adaptive responses.					
BCM364	BUILDING THE CELL 364				
NAS_BCM	BCM322	English	2 + 1	K4	9
Membrane structure: plasma membrane structure, organisation of lipid membranes, membrane proteins, glycoproteins and glycolipids, principles of membrane organisation, specialisations of the plasma membrane. Transport across cell membranes: major types of membrane transport proteins; diffusion of small molecules across pure phospholipid bilayers; uniporter-catalysed transport of specific molecules; ion channels, intracellular ion environment and membrane electric potential; active ion transport and ATP hydrolysis; cotransport catalysed by symporters and antiporters; osmosis, water channels and the regulation of cell volume. Organelle biogenesis: mitochondrial DNA; synthesis and localisation of mitochondrial proteins; chloroplast DNA and the biogenesis of chloroplasts and other plastids, peroxisome biosynthesis; protein traffic into and out of the nucleus.					
BDO181	INDUSTRIAL AND ORGANIZATIONAL PSYCHOLOGY 181				
EB_BDO	n a	Bilingual	4 + 0	J1	5
Capita Selecta: This course will provide an introduction to personnel psychology, organisational behaviour and labour relations. It will refer to the selection of employees, the training and development of human resources in order to adapt to changing circumstances. The role of leadership in group utilisation and motivation will be discussed both theoretically and practically. Labour relations will be studied in terms of the institutional processes and service relationship and will include practical aspects such as grievance handling, disciplining and dispute resolution.					
BDO219	INDUSTRIAL AND ORGANIZATIONAL PSYCHOLOGY 219				
EB_BDO	n a	Bilingual	3 + 0	S1	16
<i>Group behaviour and leadership</i> This module will focus on organisational behaviour with specific reference to the principles of group behaviour and the role of work teams in the organisation. Particular attention will be paid to group development, group interaction, group structures, group processes and the promotion of team performance in the organisation. Leadership and the effect of power and politics in the organisation will be studied. The function of leadership in individual, group and task-oriented behaviour will also be addressed.					
<i>Organisational behaviour</i> The behavioural basis for organisational structuring and organisation design will be addressed. This will include organisational culture as important facet in any organisation. The dynamics and approaches to organisational change will be addressed with specific reference to the role of change agents, resistance to change and organisational development with a practical discussion on contemporary problems related to organisational change, personnel turnover, fatigue, boredom, absenteeism, conflict, accidents.					
BEH361	HOUSING 361				
NAS_VBR	BEH221	Afrikaans	3 + 0	K3	4
Inter relationship between man's immediate environment (housing, neighbourhood and home range), his social behaviour and well being from an ecological perspective. Prerequisite: [Third-year status]					

BEM110	MARKETING MANAGEMENT 110				
EB_BEM	n a	Bilingual	3 + 0	S1	10
Fundamentals of marketing management: General overview of marketing management including the marketing concept, the process of marketing management, evolution of marketing and the marketing environment. Consumer entity, market segmentation, positioning and marketing information. Perspective of various marketing instruments in the marketing mix, for example, product decisions, distribution decisions, marketing communication decisions and pricing decisions.					
BEM161	MARKETING MANAGEMENT 161				
EB_BEM	n a	Bilingual	3 + 0	K3	5
Sales decisions: The selling process, selling techniques, management of selling corps and the management of sales promotions. A professional approach to selling techniques and the selling process, the position of personal sales in the execution of the marketing task; integration of various sales management tasks – recruitment, selection, training, remuneration and evaluation of the sales process and ethics of sales practices.					
BEM162	MARKETING MANAGEMENT 162				
EB_BEM	n a	Bilingual	3 + 0	K4	5
Introduction to the marketing of professional services: Acquiring basic marketing skills will enhance the capabilities of professionals in inter alia the accounting profession. This module provides an overview of the seven marketing instruments of a professional services marketing mix. The focus will fall on the practical implications of the characteristics of intangible products and the pricing, promotion, placement, physical evidence, process and people dimensions of professional services.					
BEM251	MARKETING MANAGEMENT 251				
EB_BEM	n a	Bilingual	3 + 0	K1	8
Internal and external influencing factors of consumer behaviour. The consumer's decision process and application fields of consumer behaviour. Consumer behaviour models and the use thereof in marketing management.					
BEM252	MARKETING MANAGEMENT 252				
EB_BEM	n a	Bilingual	3 + 0	K2	8
Marketing research: The use of marketing research in marketing decision making; the process of marketing research, research designs, random tests, consumer surveys, questionnaires, experimentation, observation, data analysis and analyses of marketing models. Scientific approach to marketing information, the influence of modern tendencies (computers, Internet).					
BEM261	MARKETING MANAGEMENT 261				
EB_BEM	n a	Bilingual	3 + 0	K3	8
Distribution decisions: The development and management of distribution channels - strategic aims, conventional marketing systems, the main role players, the integration of distribution with the other marketing instruments and relationship marketing; the influence of the external environment and channel design and management; the management of the internal channel environment; vertical marketing systems, consession agreements, relationship management and the forming of strategic alliances.					
Prerequisites: [BEM151] and [BEM152]					
BEM262	MARKETING MANAGEMENT 262				
EB_BEM	n a	Bilingual	3 + 0	K4	8
Product decisions: Problem supposition and problem determination in connection with product decisions, management strategies of the enterprise, enterprise strategy, product strategy, organisation of product strategy, product and market development strategy. Case studies, group discussions, seminars, guest speakers, visits to enterprises for meaningful integration of theory and practice. Prerequisites: [BEM151] and [BEM152]					

BEM310	MARKETING MANAGEMENT 310				
EB_BEM	n a	Bilingual	3 + 1	S1	20
Product decisions: Demarcation and terminology with regard to product decisions, management strategy of the enterprise, enterprise strategy, product strategy, organisation for product strategy, product and market development strategy. Pricing decisions: Enterprises that are primarily price determiners. Influence of cost demand and competition on the fixing of price determiners and sales prices. Practical (1 l.p.w.): Case studies, group discussions, seminars, and visits to enterprises for meaningful integration of the theory and practice. Marketing management in practice: Most recent marketing management principles and decisions. Prerequisites: [BEM151 GS] and [BEM152]					
BEM320	MARKETING MANAGEMENT 320				
EB_BEM	n a	Bilingual	3 + 1	S2	20
Distribution decisions: Design, modification and management of distribution channels. Marketing communication decisions: The role of advertising in the marketing strategy, role and selection of an advertising agency. Management of an advertising campaign. Publicity, sales-directed methods, sales management and oral communication. Practical (1 l.p.w.): Case studies, group discussions, seminars, guest speakers and visits to enterprises for meaningful integration of theory and practice.					
BEM363	MARKETING MANAGEMENT 363				
EB_BEM	n a	English	3 + 1	K3	10
Information available at the Department					
BER210	BUSINESS LAW 210				
EB_BEM	n a	Bilingual	3 + 0	S1	16
Basic principles of Law of Contract. Law of sales, credit agreements, lease.					
BER220	BUSINESS LAW 220				
EB_BEM	n a	Bilingual	3 + 0	S2	16
Labour Law. Aspects of Security Law. Law of Insolvency. Entrepreneurial Law; Company Law, Law concerning close corporation. Law of Partnerships.					
BLG150	INTRODUCTORY PLANT BIOLOGY 150				
NAS_BOT	BLG150	Double	3 + 1	S1	16
The following subjects are treated at an introductory level: Plant morphology and anatomy; reproductive biology of higher plants; properties of biomolecules; basic plant metabolism; protein biosynthesis; recombinant DNA-technology; principles of plant taxonomy; diagnostic properties of selected plant families.					
BLG160	INTRODUCTORY ANIMAL BIOLOGY 160				
NAS_ZEN	n a	Bilingual	3 + 1	S2	16
Study of animals and animal diversity. Functional morphology (structure) of vertebrates and insects. Animal development, evolution and the various kingdoms.					
BLG260	INTRODUCTION TO MICROBIOLOGY 260				
NAS_MBY	n a	Bilingual	4 + 1	K3	8
General anatomy and morphology of bacteria, viruses and fungi. Basic nutritional requirements of micro-organisms and the effect of environmental factors on microbial growth. Micro-organisms as essential components of ecospheres: plant, water and soil ecosystems. Food decay, food poisoning and preservation of food by micro-organisms. Basic principles involved in disinfection, sterilization and control of microbes; techniques for microbial repression: sterilization by using heat, radiation, filtration, chemicals; decimation of numbers.					
BME161	BIOMETRY 161				
NAS_WST	n a	Double	4 + 1	K3	8
Simple statistical analysis. Data collection and analysis: Samples, tabulation, graphical					

<p>representation, describing location, spread and skewness. Introductory probability and distribution theory. Sampling distributions and the central limit theorem. Statistical inference: Basic principles, estimation and testing in the one- and two-sample cases (parametric and non-parametric). Introduction to experimental design. One- and two-way designs, randomised blocks. Computer literacy: Use of computer packages in data analysis and report writing.</p> <p>Prerequisites: [STK113 GS] and [STK123 GS] or [At least 40% (HG) or 50% (SG) Grade 12 Mathematics or an equivalent Mathematics achievement.]</p>					
BME162	BIOMETRY 162				
NAS_WST	n a	Double	4 + 1	K4	8
<p>Multiple statistical analysis. Bivariate data sets: Curve fitting (linear and non-linear), growth curves. Statistical inference in the simple regression case. Categorical analysis: Testing goodness of fit and contingency tables. Multiple regression and correlation: Fitting and testing of models. Residual analysis. Computer literacy: Use of computer packages in data analysis and report writing.</p> <p>Prerequisite: [STK113 GS] and [STK123 GS] or [At least 40% (HG) or 50% (SG) Grade 12 Mathematics or an equivalent Mathematics achievement] and [BME161]</p>					
BME251	BIOMETRY 251				
NAS_WST	n a	Bilingual	4 + 1	K1	12
<p>Analysis of variance. Multiway classification. Testing of model assumptions, graphics. Multiple comparisons. Fixed, stochastic and mixed effect models. Block experiments. Estimation of effects. Computer literacy: Writing and interpretation of computer programs. Report writing.</p> <p>Prerequisites: [BME161] and [BME162]</p>					
BME252	BIOMETRY 252				
NAS_WST	n a	Bilingual	4 + 1	K2	12
<p>Experimental design. Principles of experimental design. Factorial experiments: Confounding, single degree of freedom approach, hierarchical classification. Balanced and unbalanced designs. Split-plot designs. Analysis of covariance. Computer literacy: Writing and interpretation of computer programs. Report writing.</p> <p>Prerequisite: [BME161], [BME 162] AND [BME 251]</p>					
BOT161	PLANT BIOLOGY 161				
NAS_BOT	n a	Bilingual	4 + 1	K4	8
<p>Basic plant structure; plant organs at work; metamorphic plant organs and their function; introductory plant taxonomy and plant systematics; the ecosystem; adaptation of plants to extreme environments; introduction to veld evaluation and veld management.</p> <p>Prerequisite: [MLB111 GS] or [TDH]</p>					
BOT251	S A FLORA AND VEGETATION 251				
NAS_BOT	n a	English	4 + 2	K1	12
<p>Origin and affinity of South African flora and vegetation types; principles of plant geography; plant diversity in Southern Africa; characteristics, environments and vegetation of Southern African biomes; major vegetation types of Southern Africa; centra of plant endemism; rare and threatened plant species; red data lists; plant conservation; international conventions; local environmental laws; conservation status of South African vegetation types.</p> <p>Prerequisite: [BOT161] or [TDH]</p>					
BOT261	PLANT BIOCHEMICAL EVOLUTION 261				
NAS_BOT	n a	Bilingual	4 + 2	K3	12
<p>Role of biochemical evolution in the survival of plants as stationary organisms (coordination of autotrophic and heterotrophic metabolism on cellular and whole plant level, nitrogen fixation, defence mechanisms and interaction with other organisms).</p>					

Families of economic importance, interrelationship between humans and plants; food, medicine, drugs and poisons, landscape architecture, energy, water and industry. Prerequisites: [BOT161] and [CMY117] and [CMY127] or [TDH]					
BOT351	POPULATION BIOLOGY 351				
NAS_BOT	n a	English	4 + 2	K1	18
Describing populations: conventional and diagrammatic life tables; importance of seed bank; population growth: exponential and logistic growth; population regulation by density-dependent factors; population dynamics: simple populations, structured populations and metapopulations; intraspecific competition; interspecific competition and coexistence; reproductive biology: flower phenology; pollen and stigma biology; reproductive systems; pollination syndromes. Prerequisite: [BOT161] or [TDH]					
BOT352	PLANT STRUCTURE AND FUNCTION 352				
NAS_BOT	n a	English	4 + 2	K1	18
Relevant aspects of cytology; cells and tissues; anatomy of roots, stems and leaves; physiological processes: absorption, transport, cell growth, cell differentiation, abscission, chemical composition of cell walls and waste products, ecological adaptations. Prerequisites: [BOT161] or [TDH] and [CMY117] or [TDH] and [CMY127] or [TDH]					
BOT353	ECOPHYSIOLOGY 353				
NAS_BOT	n a	English	4 + 2	K2	18
A description of the environment of plants: atmosphere, hydrosphere, lithosphere and phytosphere; carbon budget of whole plant and plant communities; environmental influences on growth and development: seed dormancy and germination, vegetative phase, reproductive phase, fruiting and seed dispersal; plants under stress: radiation, temperature, drought, salinity, fire, nutrients and anthropogenic stress. Prerequisite: [BOT161] or [TDH]					
BOT354	PLANT VARIATION AND EVOLUTION 354				
NAS_BOT	n a	English	4 + 2	K2	18
The biological concept of evolution; evolution of the plant genome, plant evolution revealed through comparative and functional genomics; the synteny concept; plant diversity and whole plant physiology revealed through photosynthesis, respiration, nitrogen metabolism, photomorphogenesis and growth regulation; transgenic plants as tools for understanding plant diversity; diversity of plant responses to abiotic and biotic stress; analyses of diversity of plant transcriptomes using microarrays. Prerequisites: [BOT161] or [TDH] and [MLB111] or [TDH]					
BOT361	NATURAL PRODUCT CHEMISTRY 361				
NAS_BOT	n a	English	4 + 2	K3	18
The biosynthesis and ecological role of the three main classes of secondary compounds; terpenoids, phenolics and alkaloids. The chemical mechanisms plants use to defend themselves against micro-organisms and herbivores. The role of natural products in medicine and agriculture. Prerequisites: [BOT161] or [TDH] and [CMY117] or [TDH] and [CMY127] or [TDH]					
BOT362	PLANT SYSTEMATICS 362				
NAS_BOT	n a	English	4 + 2	K3	18
Principles and practice of plant systematics. Constructing a classification; phylogeny and cladistics. Taxonomic evidence: structural and biochemical characters. Molecular systematics. Botanical nomenclature. Phylogenetic relationships of major groups of tracheophytes. Plant identification in practice; family recognition; identification methods; herbaria and botanical gardens. Prerequisite: [BOT161] or [TDH]					

BOT363	VEGETATION SCIENCE 363				
NAS_BOT	n a	English	4 + 2	K4	18
Vegetation as primary producer in the ecosystem; theory of plant community concepts; surveying techniques of vegetation and relevant environmental factors that control it; floristic and structural composition; data processing; ecological interpretation and geographical distribution of plant communities. Description of plant communities and Syntaxonomy. Vegetation dynamics and vegetation change; Practical applications of vegetation studies for vegetation management, using case studies.					
Prerequisite: [BOT161] or [TDH]					
CHM214	ORGANIC CHEMISTRY 214				
NAS_CMY	n a	Double	2 + 1	S1	8
Theory: Overview of concepts from the first year: Resonance, functional groups, structure, bonding and hybridisation in simple organic molecules. Introduction to the physical and chemical properties of the alkanes, alkenes, alkyl halides, alcohols, aldehydes, ketones, carboxylic acids, acid derivatives and aromatic compounds. Some important industrial processes and compounds. Introduction to multi-step synthesis. Practicals: Introduction to organic synthesis and general laboratory techniques like temperature control, distillation, melting point determination, thin layer chromatography, extraction, evaporation and recrystallisation. (Note: Entire semester: Two lectures per week. Three 6-hour practicals during one quarter.) Prerequisites: [CMY117] and [CMY127]					
CHM216	ANALYTICAL CHEMISTRY 216				
NAS_CMY	n a	Double	2 + 1	S1	8
Theory: Introduction to instrumental chemical analysis. Integration of electronic, chemical, optical and computer principles for the construction of analytical instrumentation. Detail discussion of principles and some instrumental methods from three disciplines within analytical chemistry, namely electrochemistry, spectroscopy and chromatography. This includes potentiometry, (AA) atomic absorption, (ICP) atomic emission, ultraviolet (UV), and infrared (IR) spectroscopy, potentiometric and photometric titrations, gas chromatography, liquid chromatography as well as combinations of these techniques. Practical: IR spectroscopy, UV spectroscopy, AA spectroscopy, potentiometric titration, gas chromatography. (Note: Entire Semester: Two lectures per week. Six 3-hour practicals during one quarter.) Prerequisites: [CMY117] and [CMY127]					
CIL171	COMPUTER LITERACY 171				
DML_DML	n a	Double	2 + 0	K1	3
Keyboard and mouse skills, e-mail, basic Internet and Web skills, basic theoretical introduction to hardware and software. Windows as operating system.					
CIL172	COMPUTER LITERACY 172				
DML_DML	n a	Double	2 + 0	K2	3
Word processing programs: Creation, editing and formatting of documents, outline editing, automatic numbering and footnotes, tables and columns, insertion of multimedia, data exchanges etc. Presentation programs: Creation of presentations, together with figures, text animation and the insertion of multimedia.					
CIL173	COMPUTER LITERACY 173				
DML_DML	n a	Double	2 + 0	K3	3
Spreadsheet programs: basic spreadsheet skills including formulas and diagrams. Database programs: Basic database skills including searches, compilation of reports, etc.					
CIL174	COMPUTER LITERACY 174				
DML_DML	n a	Double	2 + 0	K4	3
Search strategy formulation: the use of Boolean operators, natural language, controlled language. Searches on CD-ROM and the Internet; the evaluation of Internet search engines. The analysis, organization and synthesizing of information. Resources study.					

CMY101	CHEMISTRY 101				
NAS_CMY	n a	English	4 + 1.5	J1	16
Theory: General introduction to inorganic and analytical chemistry. Nomenclature of inorganic ions and compounds, stoichiometric calculations concerning chemical reactions, redox reactions, solubilities, atomic structure, periodicity. Practicals: (Four lectures and one 3-hour practical or tutorial per week.) Theory: Inorganic and physical chemistry. Molecular structure and chemical bonding using the VSEPR and hybridization models. Principles of reactivity, electrochemistry, energy and chemical reactions, entropy and free energy. Practicals. (Note: Four lectures and one 3-hour practical or tutorials per week.)					
CMY102	CHEMISTRY 102				
NAS_CMY	n a	English	4 + 1.5	J1	16
Theory: General physical-analytical chemistry: Physical behaviour of gases, liquids and solids, intermolecular forces, solutions, chemical equilibrium, acids and bases, buffers, precipitation. Descriptive inorganic chemistry: Main group and transition elements. Practicals. Theory: Organic chemistry: Structure (bonding), nomenclature, isomerism, introductory stereochemistry, introduction to chemical reactions and chemical properties of organic compounds. Practicals: Molecular structure (model building sessions), synthesis and properties of simple organic compounds. (Note: Four lectures and one 3-hour tutorial per week, One semester: One 3-hour practical weekly or one every second week.)					
Prerequisite: [CMY101]					
CMY117	GENERAL CHEMISTRY 117				
NAS_CMY	CMY152 en CMY153	Double	4 + 1	S1	16
Atomic structure. Electron configuration and periodicity. Periodic table and properties of elements. Molecules and molecular models. Covalent model. Nomenclature. Molecular structure and chemical bonding using VSEPR models. Writing and balancing of chemical reactions. Stoichiometry. Qualitative and quantitative aspects of aqueous acid-base, redox and precipitation reactions. Practicals: (Note: Four lectures and one 3-hour practical or tutorial per week.)					
Prerequisite: [Par 1.2]					
CMY127	GENERAL CHEMISTRY 127				
NAS_CMY	CMY 161 EN CMY162	Double	4 + 1	S2	16
Physical Chemistry: Gases and their properties. Intermolecular forces. Liquids. Solutions. Colligative properties. Thermochemistry. Electrochemistry. Organic chemistry: Molecular geometry of C, O and N. Recognition of functional groups. Nomenclature. Naming of organic molecules with more than one functional group. Conformational analysis. Isomerism: Structural- and stereoisomerism. Introduction to organic reactions and reaction mechanisms. Introduction to biological molecules: carbohydrates, proteins and amino acids, fatty acids. Practicals. (Note: Four lectures and one 3-hour practical or tutorial per week.) Prerequisite: [CMY117 GS or CMY101]					
CMY151	CHEMISTRY 151				
NAS_CMY	n a	Bilingual	4 + 1	S1	16
Theory: Introduction to general chemistry: Measurement in chemistry, matter and energy, atomic theory and the periodic table, chemical compounds and chemical bonds, quantitative relationships in chemical reactions, states of matter and the kinetic theory, solutions and colloids, acids, bases and ionic compounds, chemical equilibria. Introduction to organic chemistry: Chemical bonding in organic compounds, nature, physical properties and nomenclature of simple organic molecules, isomerism, chemical properties of alkanes and cycloalkanes, alkenes, alcohols, aldehydes and ketones, carboxylic acids and esters, amines and amides, carbohydrates, proteins, and lipids. Practicals: (Note: Four lectures and one 3-hour practical or tutorial or model building session per week.)					
Prerequisite: [Par 1.2]					

CMY282	PHYSICAL CHEMISTRY 282				
NAS_CMY	n a	English	4 + 1	K1	12
Theory: Classical chemical thermodynamics, gases, first and second law and applications, physical changes of pure materials and simple compounds. Phase rule: Chemical reactions, chemical kinetics, rates of reactions. Practicals. (Note: Four lectures and one 6-hour practical per week.) Prerequisites: [CMY117 or CMY101 and CMY102] and [CMY127 or CMY101 and CMY102]					
CMY283	ANALYTICAL CHEMISTRY 283				
NAS_CMY	n a	English	4 + 1	K3	12
Theory: Statistical evaluation of data, gravimetric analysis, aqueous solution chemistry, chemical equilibrium, precipitation-, neutralisation- and complex formation titrations, redox titrations, potentiometric methods, introduction to electrochemistry. Practicals. (Note: Four lectures and one 6-hour practical per week.) Prerequisites: [CMY117 or CMY101 and CMY102] and [CMY127 or CMY101 and CMY102]					
CMY284	ORGANIC CHEMISTRY 284				
NAS_CMY	n a	English	4 + 1	K2	12
Theory: Organic reactivity: Rates and equilibrium. Conjugation and resonance: Allylic systems, aromaticity, aromatic reactivity, alkylhalides, alcohols, ethers, electrophilic substitution. Carbonyl compounds: ketones, aldehydes, carboxylic acids and their derivatives. Dynamic stereochemistry: Nucleophilic substitution, elimination, addition. Practicals. (Note: Four lectures and one 6-hour practical per week.) Prerequisites: [CMY117 or CMY101 and CMY102] and [CMY127 or CMY101 and CMY102]					
CMY285	INORGANIC CHEMISTRY 285				
NAS_CMY	n a	English	4 + 1	K4	12
Theory: Atomic structure, structure of solids (ionic model). Co-ordination chemistry of transition metals: Oxidation states of transition metals, ligands, stereochemistry, crystal field theory, consequences of d-orbital splitting, chemistry of the main group elements, acid-base concepts, non-aqueous solvents, electrochemical properties of transition metals in aqueous solution, industrial applications of transition metals. Practicals. (Note: Four lectures and one 6-hour practical per week.) Prerequisites: [CMY117 or CMY101 and CMY102] and [CMY127 or CMY101 and CMY102]					
CMY380	MATERIAL SCIENCE 380				
NAS_CMY	n a	English	4 + 1	K4	18
Theory: A selection of courses from: Introduction to materials, polymers, metals and alloys, functional materials, ceramics, inorganic materials, organic materials, practical work based on projects and visits to industries. (Note: Four lectures and one 6-hour practical per week.) Prerequisites: [CMY282] and [CMY283] and [CMY284] and [CMY285]					
CMY382	PHYSICAL CHEMISTRY 382				
NAS_CMY	n a	English	4 + 1	K1	18
Theory: Molecular quantum mechanics. Introduction: Shortcomings of classical physics, dynamics of microscopic systems, quantum mechanical principles, translational, vibrational and rotational movement. Atomic structure and spectra: Atomic hydrogen, multiple electron systems, spectra of complex atoms, molecular structure, the hydrogen molecule ion, diatomic and polyatomic molecules, structure and properties of molecules. Molecular spectroscopy: Rotational and vibrational spectra, electronic spectra, resonance techniques. Statistical thermodynamics: Molecular energy levels and the Boltzmann					

distribution, statistical entropy, partition functions, calculation of thermodynamic properties. Practicals. (Note: Four lectures and one 6-hour practical per week.)					
Prerequisite: [CMY282]					
CMY383	ANALYTICAL CHEMISTRY 383				
NAS_CMY	n a	English	4 + 1	K2	18
Theory: Complexometry and complexometric equilibrium, separation methods: Extraction, ion exchange, chromatographic systems, spectroscopy: Construction of instruments, atomic absorption and atomic emission spectrometry, electrochemistry. Practicals. (Note: Four lectures and one 6-hour practical per week.) Prerequisite: [CMY283]					
CMY384	ORGANIC CHEMISTRY 384				
NAS_CMY	n a	English	4 + 1	K3	18
Theory: Aromatic and hetero-aromatic chemistry, synthetic methodology in organic chemistry: Carbon-carbon bond formation: Alkylation at nucleophilic carbon sites, aldol and related condensations, Wittig and related reactions, acylation of carbanions (Claisen condensation), addition of carbon radicals to alkenes and alkynes, cyclo-addition reactions. Practicals. (Note: Four lectures and one 6-hour practical per week.)					
Prerequisite: [CMY284]					
CMY385	INORGANIC CHEMISTRY 385				
NAS_CMY	n a	English	4 + 1	K4	18
Theory: Structure and bonding in inorganic chemistry: Molecular orbital approach, diatomic and polyatomic molecules, three-centre bonds, metal-metal bonds, transition metal complexes, magnetic properties, electronic spectra, reactivity and reaction mechanisms, reaction types, special topics. Practicals. (Note: Four lectures and one 6-hour practical per week.)					
Prerequisite: [CMY285] and [CMY 282]					
CMY386	CHEMICAL PROCESS TECHNOLOGY 386				
NAS_CMY	n a	English	4 + 1	K1	18
Theory: Principles of chemical process technology, flow diagrams, mass and energy balances, momentum transfer, heat transfer, mass transfer, reactor types, distillation, extraction and flotation, microbiological processes, process control, formulation chemistry. Practicals: Projects. (Note: Four lectures and one 6-hour practical per week.)					
Prerequisite: [CMY282]					
CMY388	CHEMOMETRICS 388				
NAS_CMY	n a	English	4 + 1	K3	18
Theory: Basic concepts from statistics, signal processing, time-series analysis, optimisation, experimental design, pattern recognition and classification, mathematical modelling and quality control. Practicals: Calculations and application of the course contents with spread sheet programs, good laboratory practice, literature access. (Note: Four lectures and one 6-hour practical per week.)					
Prerequisites: [CMY282] and [CMY283] and [CMY284] and [CMY285]					
CMY389	CHEMICAL ANALYSIS 389				
NAS_CMY	n a	English	4 + 1	K2	18
Theory: Automation and automated process control, application of complexometric reactions, advanced UV/visible spectrometry, X-ray fluorescence spectrometry, molecular fluorescence, phosphorescence and chemiluminescence. Practicals. (Note: Four lectures and one 6-hour practical per week.)					
Prerequisite: [CMY283]					
COS110	PROGRAM DESIGN AND EVALUATION 110				
NAS_COS	n a	Double	4 + 1	S1	16
The study material is divided into the following parts:- 1. Object-oriented programming, graphical user interfaces and event handling. Emphasis on sound program design, well					

structured and documented programs, and robustness (no errors). 2. General background to the discipline of Computer Science.					
Prerequisite: [Par 1.2]					
COS130	INTRODUCTION TO PROGRAMMING 130				
NAS_COS	n a	Double	4 + 1	S1	16
Introduction to the programming language C, covering fundamental computer programming concepts in order to write well structured, efficient programs. Topics that are covered include statement sequences, selection, iteration, arrays, sorting and searching, functions, parameter transfer, basic data structures, pointers and elementary file handling. An introduction is given to more advanced data structures.					
Prerequisite: [Par 1.2]					
COS160	BRIDGING COURSE 160				
NAS_COS	n a	English	4 + 1	S2	16
Introductory programming in an appropriate high-level language as preparation for COS110. This includes statement sequences, selection, iteration, arrays, sorting and searching, modularity (functions and procedures), parameter transfer, elementary file handling.					
Prerequisite: [Par 1.2;students who passed Computer Studies HG on grade 12 level will be exempted]					
COS212	DATA STRUCTURES AND ALGORITHMS 212				
NAS_COS	n a	Double	2 + 1	S2	12
Data abstraction for producing correct and reusable software. Designing abstract data types for the classic data structures, i.e. stacks, queues, lists, trees and graphs. Variations that can be made to the implementation of the structures without changing their interfaces. Choosing the appropriate version for efficiency. Classic algorithms for sorting, searching and traversing, and their efficiency. Recursive implementation of some of the algorithms. The meaning of algorithmic complexity and an appreciation of the limits of computing, through examples of problems that cannot be solved in reasonable time.					
Prerequisite: [COS110] or [TDH]					
COS213	ADVANCED PROGRAMMING 213				
NAS_COS	n a	Double	2 + 1	S2	12
The course teaches students advanced programming skills using an object-oriented programming language that is widely used in industry. Formal methods for program design and program verification are also studied, based on a formal notation.					
Prerequisite: [COS110] or [TDH]					
COS221	DATABASES 221				
NAS_COS	n a	Double	2 + 1	S2	12
This module is an introduction to databases, database management systems and the design of a database. The design of databases is done according to the 'Entity Relationship' model. The focus is on relational database systems. Distributed databases, object databases and logic databases are also introduced. A 4GL is used on a state of the art enterprise resource planning (ERP) system to practically illustrate theoretical concepts.					
Prerequisite: [COS110] or [TDH]					
COS222	OPERATING SYSTEMS 222				
NAS_COS	n a	Double	2 + 1	S1	12
Design issues for each of the following functional areas of operating systems are studied: process management, memory management, file systems, input/output management and deadlock. A number of case studies of operating systems are analysed as examples of operating system design.					
Prerequisite: [COS110] or [TDH]					

COS283	SYSTEM INTEGRATION 283				
NAS_COS	n a	Double	2 + 1	S2	12
An introduction to proper coding standards. Networking principles focusing on the use of Java for WWW and network programming, including HTML, Java script, applets, ports and sockets. Remote method invocation (RMI) in Java applications. Database connectivity using JDBC.					
Prerequisite: [COS110] or [TDH]					
COS284	COMPUTER ARCHITECTURE 284				
NAS_COS	n a	Double	2 + 1	S1	12
The aim of this course is to gain a deeper understanding of computers by studying their underlying components. The CPU is studied in great detail, covering design decisions such as CISC/RISC architectures, paging and pipelining. Cache, memory and bus architectures will also be scrutinized. IO architectures will be covered (i.e. polling vs. interrupt driven or DMA). Topics such as parallel processing (SIMD) are also touched. A brief review of number systems, combinatorial circuits, and sequential circuits (latches, counters etc.). To illustrate many of the concepts in practice, the practicals will cover an assembly language. This will cover topics like interrupts, IO and video memory.					
Prerequisite: [COS110] or [TDH]					
COS289	INTRODUCTION TO DIGITAL SYSTEMS 289				
NAS_COS	n a	English	2 + 1	S2	12
Introduction to digital circuit design, digital representation of numbers, representation and simplification of logic functions, analysis and design of combinatorial circuits, components of sequential circuits, programmable components for combinatorial and sequential logic, microprocessor fundamentals.					
Prerequisites: [COS110] and [WTW115]					
COS301	SOFTWARE ENGINEERING 301				
NAS_COS	n a	English	1 + 1	J1	18
The course exposes students to problems associated with software development on an industrial scale. Overall goals of the course are: * to understand the software engineering process and to appreciate its complexity; * to be exposed to a variety of methodologies for tackling different stages of the software life cycle; * to become familiar with the latest trends in software engineering; * to experience the advantages and problems of working in a group; * to undergo a variety of roles within a group, and to understand the different requirements each has; * to complete the development of a fairly large OO-based software product. The focus of the course is on a project that lasts the whole year. The project is tackled in groups of approximately 4 students.					
Prerequisite: [Par. 2.2]					
COS314	ARTIFICIAL INTELLIGENCE 314				
NAS_COS	n a	English	2 + 1	S1	18
In this course, classical themes in AI are studied such as planning, searching, image recognition, machine learning, etc. A particular focus is placed on the modern AI theme of computational intelligence, with reference to neural networks, intelligent agents, genetic and evolutionary algorithms, etc. Concepts are consolidated through homework and practical assignments.					
Prerequisite: [Par. 2.2]					
COS324	CONCURRENT AND DISTRIBUTED SYSTEMS 324				
NAS_COS	n a	English	2 + 1	S2	18
As its name suggests, this course has two parts. The first looks at concurrency, what it means, how it can be exploited, and what facilities are available for proving programs correct. Classical algorithms for the control and synchronisation of concurrent processes are studied. The second part of the course looks at real distributed systems, in particular					

operating systems. Issues discussed are communication, clocks, mutual exclusion, atomic transaction, deadlock, file systems, threads and processor allocation - all in a distributed environment. Languages available for concurrent and distributed programming are discussed.

Prerequisite: [COS222 Par. 2.2]

COS332	COMPUTER NETWORKS 332				
NAS_COS	n a	English	2 + 1	S2	18

The objective of this course is to acquaint the student with the terminology of communication systems and to form a good understanding of exactly how data is transferred in such communication networks, as well as applications that can be found in such environments. The study material includes: concepts and terminology, the hierarchy of protocols according to the OSI and TCP/IP models, protocols on the data level, physical level and network level and the X.25 network interface standard, as well as higher level protocols. Other related areas like high speed networks, ISDN and distributed systems are also discussed. The working of networks is illustrated by means of projects.

Prerequisite: [Par. 2.2]

COS333	PROGRAMMING LANGUAGES 333				
NAS_COS	n a	English	2 + 1	S2	18

The overall goal of the course is to survey characteristics of the most important kinds of programming languages. Three paradigms are studied: imperative, functional and logic. The syntax, semantics and implementation of various languages within these paradigms are studied, critiqued and cross-compared. Students are given practical exercises in each of these language paradigms, as well as in scripting languages.

Prerequisite: [Par. 2.2]

COS341	COMPILER CONSTRUCTION 341				
NAS_COS	n a	English	2 + 1	S1	18

The course illustrates how to build a complete compiler for a mini-language. As such, it serves as an example of an meaningful full-scale software engineering project. The compilation is based on recursive-descent parsing and a generic RISC architecture is used for the target machine. Related themes such as error handling and code optimisation are also discussed.

Prerequisite: [Par. 2.2]

COS343	TRENDS IN INFORMATION TECHNOLOGY 343				
NAS_COS	n a	English	2 + 1	S1	18

The content of this course is specifically intended to keep students abreast of new and important trends in IT. The course focuses on relevant topics that vary from year to year at the discretion of the department.

Prerequisite: [Par. 2.2]

COS344	COMPUTER GRAPHICS 344				
NAS_COS	n a	English	2 + 1	S2	18

The aim of this course is to acquire a sound knowledge of the basic theory of interactive computer graphics and basic computer graphics programming techniques. The theory will cover graphics systems and models, graphics programming, input and interaction, geometric objects and transformations, viewing in 3D, shading, rendering techniques, and introduce advanced concepts, such as object-oriented computer graphics, discrete techniques, curves and surfaces, and visualisation. The course includes a practical component that enables students to apply and test their knowledge in computer graphics. The OpenGL graphics library and application programmer's interface (API) and the C programming language will be used for this purpose. After completing the course, a student should be able to design and implement computer graphics applications that allow interaction, 3D manipulation of graphic primitives, animation and walk throughs, using the

OpenGL language. At a theoretical level the student would have a sound knowledge of the basic concepts and mathematics of computer graphics and have an introductory knowledge of more advanced issues.					
Prerequisite: [WTW126 Par. 2.2]					
COS389	MICROPROCESSOR SYSTEMS 389				
NAS_COS	n a	English	2 + 1	S2	18
Covers the following areas of the 80x86 IBM PC and compatible computers: microprocessors and supporting chips, memory and memory interfacing, input/output and interfacing, timer and music, interrupts, device drivers, buses, programming in C and assembly language.					
Prerequisite: [COS289 and Par. 2.2 or TDH]					
DAF250	ANIMAL ANATOMY AND PHYSIOLOGY 250				
NAS_VKU	n a	English	4 + 1	S1	18
General plan of the animal body. Cells, tissues and systems in the animal body. Body water. Anatomy, physiology and histology of tissues and organ systems in domestic animals. The skeleton, nervous system, skin, muscles, joints, circulatory system, respiration and endocrinology. Demonstrations on skeletons and animals.					
Prerequisites: [CMY127] and [TDH]					
DAF260	ANIMAL ANATOMY AND PHYSIOLOGY 260				
NAS_VKU	n a	English	4 + 1	S2	18
Anatomy and physiology of skeletal muscles, respiratory system and kidneys. Acid-base balance and pH-homeostasis of the animal body. Anatomy and physiology of the digestive systems of monogastric and ruminant animals. Lactation physiology, neuro-endocrinology and the RE system. Dissections and demonstrations on carcasses and animals.					
Prerequisite: [DAF250]					
DAN310	ANIMAL ANATOMY 310				
NAS_VKU	n a	Afrikaans	1 + 0.5	S1	8
Functional anatomy, growth and development of tissues and organ systems. Changes during maturation, reproduction, the post-partum period and lactation. Ageing and tissue changes with erosion diseases. The influence of hormones, production and reproduction on conformation and a critical evaluation of assessment of animals for functional efficiency.					
Prerequisites: [DAF250] and [DAF260]					
DFS311	ANIMAL PHYSIOLOGY 311				
NAS_VKU	n a	Bilingual	2 + 0	S1	10
Homeostasis and Homeorhesis in animals: Thermoregulation. Adaptation of glucose, lipid and protein metabolism in response to short and long-term changes in the supply and balance of nutrients and to changes in tissue demand for nutrients during different physiological states. Deviations from normal homeostasis, metabolic diseases and the prevention thereof. Pathogenesis of inflammation and infections; immunity.					
Prerequisites: [DAF250] and [DAF260]					
DFS320	GROWTH PHYSIOLOGY 320				
NAS_VKU	n a	Bilingual	2 + 0.5	S2	10
The underlying physiological processes in growth and development. Pre- and post-natal growth and factors which determine growth rate: growth curves, stimulants of growth, age, nutrition, race, gender, et al.					
Prerequisites: [DAN310] and [DFS311]					
EKN110	ECONOMICS 110				
EB_EKN	n a	Bilingual	3 + 0	S1	10
The economic environment and problem: working and course of the South African economy; functioning and interrelationships of the different economic sectors. Macro-					

economic theory and analysis. Analyse and interpret economic performance criteria; economic growth, inflation, job creation, balance of payments and exchange rate stability, income distribution. Calculate and interpret core economic indicators. Basic micro-economic principles: demand analysis (consumer theory); supply analysis (producer theory). Market analysis: market equilibrium; price determination; market forms; market failure; calculate and interpret price, income and cross elasticities.					
EKN120	ECONOMICS 120				
EB_EKN	n a	Bilingual	3 + 0	S2	10
Conceptualise the interrelationships of the different sectors. The functioning of international trade, government economics and policy, the labour market, monetary economics, economic development, environmental economics with specific reference to the South African context. The impact of national and international decisions and events on the South African economy. Prerequisite: [EKN110 GS]					
EKN171	ECONOMICS 171				
EB_EKN	n a	Bilingual	1 + 0	J1	5
A practical course that integrates mathematical and statistical techniques with economic theory and data. Collect, analyse and interpret South African and international economic data.					
EKN220	ECONOMICS 220				
EB_EKN	n a	Bilingual	3 + 0	S2	16
International economic insight is provided into international economic relations and history, theory of international trade, international capital movements, international trade politics, economic and customs unions and other forms of regional co-operation and integration, international monetary relations, foreign exchange markets, exchange rate issues and the balance of payments, as well as open economy macroeconomic issues.					
EKN251	ECONOMICS 251				
EB_EKN	n a	Bilingual	3 + 0	K1	8
From Wall and Bay Street to Diagonal Street, a thorough understanding of the mechanisms and theories explaining the workings of the economy is essential. Macro-economic insight is provided on the real market, the money market, two market equilibrium, monetarism, growth theory, conjuncture analysis, inflation, Keynesian general equilibrium analysis and fiscal and monetary policy issues.					
EKN252	ECONOMICS 252				
EB_EKN	n a	Bilingual	3 + 0	K2	8
Micro-economic insight is provided into consumer and producer theory, general micro-economic equilibrium, Pareto-optimality and optimality of the price mechanism, welfare economics, market forms and the production structure of South Africa.					
EKN271	ECONOMICS 271				
EB_EKN	n a	Bilingual	1 + 0	J1	8
A practical course designed to bring together the knowledge gained in Economics 251, 252 and 220 and combine it with statistics, basic mathematics and research knowledge in order to gain analytical experience needed in the job market. This course will make use of computers and information technology in order to build practical skills required of every economist and econometrician.					
EKN310	ECONOMICS 310				
EB_EKN	n a	Bilingual	3 + 0	S1	20
Welfare economics (optimality of the market mechanism, general equilibrium, market failure and the role of the government); general macro-economic policy: public finance theory and fiscal policy, monetary policy, public debt management policy; international trade and balance of payments adjustment policies; modern macro-economic policy					

considerations and development. Macro-economic policy – implementation in SA: monetary policy, fiscal policy, competition policy, labour policy, SA development issues/policies.					
EKN320	ECONOMICS 320				
EB_EKN	n a	Bilingual	3 + 0	S2	20
Identification, collection and interpretation process of relevant economic data; national accounts (i.e. income and production accounts, the national financial account, the balance of payments and input-output tables); economic growth; inflation; employment, unemployment, wages, productivity and income distribution; business cycles; financial indicators; fiscal indicators; social indicators; international comparisons; relationships between economic time series – regression analysis; long-term future studies and scenario analysis; overall assessment of the SA economy over the period from 1960 onwards.					
EKN363	ECONOMICS 363				
EB_EKN	n a	Bilingual	3 + 0	S2	20
Economic systems: Types, origin and historical development, history of economic thought, underdeveloped countries, types of underdeveloped countries, influence of population pressure and international relations on development; underdeveloped regions in developed countries, development co-operation and development policy, the history of western and other economic systems.					
EOT151	LINGUISTIC SKILLS DEVELOPMENT I 151				
GW_EOT	n a	Bilingual	2 + 0	K1	3
Knowledge of basic grammar and basic vocabulary is revised, using documentary texts that are thematically subject-related. In terms of skills the focus is placed on the development of the receptive skills (listening and reading) on text level, while the development of the productive skills (speaking and writing) will also receive attention, but only on paragraph level.					
EOT152	LINGUISTIC SKILLS DEVELOPMENT II 152				
GW_EOT	n a	Bilingual	2 + 0	K2	3
Knowledge of general academic vocabulary is developed by means of general academic texts, which are thematically subject-related. A foundation is laid in the knowledge of text grammar and argumentation forms. All four the linguistic skills (listening, reading, speaking and writing) are practiced on text level.					
EOT153	LINGUISTIC SKILLS DEVELOPMENT III 153				
GW_EOT	n a	Bilingual	2 + 0	K3	3
Knowledge of subject specific vocabulary is developed, using subject specific academic and scientific texts. Basic knowledge of text grammar and argumentation forms is broadened. Specific attention is given to the application of the two receptive skills (listening and reading) for academic purposes.					
EOT154	LINGUISTIC SKILLS DEVELOPMENT IV 154				
GW_EOT	n a	Bilingual	2 + 0	K4	3
The focus is on developing and applying the four linguistic skills on text level for academic purposes. The two productive skills (speaking and writing) will receive special attention.					
ERG281	ERGONOMICS 281				
NAS_VBR	ERG110	Afrikaans	2 + 1	K1	4
Introduction to selected ergonomic principles as applied in the selection of equipment and furniture and the planning of work and living areas to achieve certain goals of design.					
ERG282	ERGONOMICS 282				
NAS_VBR	ERG110	Afrikaans	2 + 1	K4	4
Application of ergonomic principles in analysing work, for planning good work procedures and work flow.					
Prerequisite: [ERG281]					

EST161	AESTHETICS 161				
NAS_VBR	ONT221	Afrikaans	1 + 1	K3	4
Introduction to aesthetics: framework of approach; physical as premise; role of clothing and clothing environments; perceptual process; factors that influence evaluation. Prerequisite: [OBG152]					
EST162	AESTHETICS 162				
NAS_VBR	ONT221	Afrikaans	1 + 1	K4	4
Aesthetics of the product: Design elements in clothing products; visual, tactile, audio and olfactory elements; complexity, order, novelty. Prerequisite: [EST161]					
EST251	AESTHETICS 251				
NAS_VBR	ONT221	Afrikaans	2 + 1	K1	6
Aesthetics of the consumer: Figure analysis; colour; design elements: clothing product plus figure. Prerequisite: [EST162]					
EST262	AESTHETICS 262				
NAS_VBR	ONT221	Afrikaans	1 + 1	K4	4
Aesthetics of the environment: Visual presentation in clothing environments. Prerequisite: [EST251]					
EST351	AESTHETICS 351				
NAS_VBR	ONT311	Afrikaans	1 + 1	K1	6
Analysis, forecast and presentation techniques (plus technical drawings and story boards). Prerequisite: [EST251]					
EST352	AESTHETICS 352				
NAS_VBR	ONT311	Afrikaans	0 + 2	K2	6
Presentation techniques using CAD. Prerequisite: [EST351]					
FAR305	PHARMACOLOGY 305				
MED_FAR	n a	Bilingual	3 + 0	J1	18
Receptors, antagonism, kinetic concepts. Medicines with regard to: autonomous and central nervous system, asthma, hypertension, angina and pain. Antibiotics and other anti-infective medicines. Medicines for local anaesthetics, anaesthesia, migraine, digestive tract and podagra. Hormones and vitamins.					
FBS100	FINANCIAL MANAGEMENT 100				
EB_RFB	n a	Bilingual	3 + 0	J1	20
Business valuation; current asset management; long-term financing decisions. Prerequisite: [Par.1.2]					
FBS252	FINANCIAL MANAGEMENT 252				
EB_RFB	n a	Bilingual	3 + 0	K2	8
Business valuation; current asset management; long-term financing decisions.					
FBS262	FINANCIAL MANAGEMENT 262				
EB_RFB	n a	Bilingual	3 + 0	K4	8
Cost of capital; determination of capital requirements and the financing of a business to maintain the optimal capital structure; dividend decisions.					
FLG211	INTRODUCTORY AND NEUROPHYSIOLOGY 211				
NAS_FLG	n a	Afrikaans	2 + 1	S1	16
Orientation in physiology, homeostasis, cells, tissues, muscle, neurophysiology and the special senses. Prerequisites: [CMY117 GS] and [CMY127 GS] and [MLB111 GS] and [PHY171 GS or PHY131 GS] or [TDH]					

FLG212	CIRCULATORY PHYSIOLOGY 212				
NAS_FLG	n a	Afrikaans	2 + 1	S1	16
Body fluids; haematology; cardiovascular physiology and the lymphatic system. Prerequisites: [CMY117 GS] and [CMY127 GS] and [MLB111 GS] and [PHY171 GS or PHY131 GS] or [TDH]					
FLG221	PHYSIOLOGY 221				
NAS_FLG	n a	Afrikaans	2 + 1	S2	16
Structure, gas exchange and secretory function of the lungs, structure, excretory and non-urinary function of the kidneys; acid-base balance as well as skin and body temperature control. Prerequisites: [FLG211 GS] and [FLG212 GS] or [TDH]					
FLG222	DIGESTION, ENDOCRINOLOGY AND REPRODUCTIVE SYSTEMS 222				
NAS_FLG	n a	Afrikaans	2 + 1	S2	16
Nutrition, digestion and metabolism; hormonal control of the body functions and the reproductive systems. Prerequisites: [FLG211 GS] and [FLG212 GS] or [TDH]					
FLG311	APPLIED CELLULAR PHYSIOLOGY 311				
NAS_FLG	n a	Afrikaans	1 + 1	S1	14
Study of cell morphology, functions of the cell organelles, synthesis of the various membrane en cytoskeleton proteins, activation of proteins through phosphorylation which is controlled by signal transduction mechanisms, processes involved in controlling cell numbers, background for cell-based experiments and research. Prerequisites: [BCM216 GS] and [BCM217 GS] and [BCM226 GS] and [BCM227 GS] and [FLG221 GS] and [FLG222 GS] or [TDH]					
FLG312	DEVELOPMENTAL PHYSIOLOGY 312				
NAS_FLG	n a	Afrikaans	2 + 0	S1	9
Study on the physiological development and adaptations for the foetus to the old aged. Prerequisites: [BCM216 GS] and [BCM217 GS] and [BCM226 GS] and [BCM227 GS] and [FLG221 GS] and [FLG222 GS] or [TDH]					
FLG313	RESEARCH METHODS AND LITERATURE STUDY 313				
NAS_FLG	n a	Afrikaans	1 + 1	S1	14
Research methodology, career planning, subject-orientated literature studies and seminars. Prerequisites: [BCM216 GS] and [BCM217 GS] and [BCM226 GS] and [BCM227 GS] and [FLG221 GS] and [FLG222 GS] or [TDH]					
FLG314	IMMUNOLOGY 314				
NAS_FLG	n a	Afrikaans	1 + 0	S1	9
Introduction to basic, applied and integrated immunological mechanisms. Prerequisites: [BCM216 GS] and [BCM217 GS] and [BCM226 GS] and [BCM227 GS] and [FLG221 GS] and [FLG222 GS] or [TDH]					
FLG322	INDUSTRIAL PHYSIOLOGY 322				
NAS_FLG	n a	Afrikaans	1 + 1	S2	9
Problem orientated course, with the emphasis on occupational health and safety in the industrial environment. Integration of different physiological systems. Prerequisites: [BCM216 GS] and [BCM217 GS] and [BCM226 GS] and [BCM227 GS] and [FLG221 GS] and [FLG222 GS] or [TDH]					
FLG323	PHYSIOLOGICAL CONTROL SYSTEMS AND MODELLING 323				
NAS_FLG	n a	Afrikaans	0 + 1	S2	9
An introduction to the theory of control systems and examples in physiology to explain them; simulation of physiological functions making use of signal-flow diagrams and					

mechanical, electrical and numerical models.					
Prerequisites: [BCM216 GS] and [BCM217 GS] and [BCM226 GS] and [BCM227 GS] and [FLG221 GS] and [FLG222 GS] or [TDH]					
FLG324	EXERCISE PHYSIOLOGY 324				
NAS_FLG	n a	Afrikaans	1 + 1	S2	9
Mechanisms of muscle contraction and energy sources. Cardio-respiratory changes, thermoregulation and other adjustments during exercise. Use and misuse of substances to improve performance.					
Prerequisites: [BCM216 GS] and [BCM217 GS] and [BCM226 GS] and [BCM227 GS] and [FLG221 GS] and [FLG222 GS] or [TDH]					
FLG325	NUTRITIONAL PHYSIOLOGY 325				
NAS_FLG	n a	Afrikaans	1 + 0	S2	9
The importance of nutrients and micro-nutrients in the composition of a normal diet; the neuro-endocrine control of food intake and special aspects of the functions in the digestive tract.					
Prerequisites: [BCM216 GS] and [BCM217 GS] and [BCM226 GS] and [BCM227 GS] and [FLG221 GS] and [FLG222 GS] or [TDH]					
FLG327	HIGHER NEUROLOGICAL FUNCTIONS 327				
NAS_FLG	n a	Afrikaans	0 + 1	S2	18
Tutorials and seminars on higher functions of the brain and interaction between the neurological, endocrine and immune systems.					
Prerequisites: [BCM216 GS] and [BCM217 GS] and [BCM226 GS] and [BCM227 GS] and [FLG221 GS] and [FLG222 GS] or [TDH]					
FLG328	PATHOPHYSIOLOGY 328				
NAS_FLG	n a	Afrikaans	1 + 0	S2	9
Human pathophysiology.					
Prerequisites: [BCM216 GS] and [BCM217 GS] and [BCM226 GS] and [BCM227 GS] and [FLG221 GS] and [FLG222 GS] or [TDH]					
FPP451	CHEMICAL AND MICROBIOLOGICAL ASPECTS OF FOOD 451				
NAS_VDW	VOV483	English	2 + 1	S1	20
Chemical aspects: The role and composition of the major chemical components of food (water, carbohydrates, proteins and lipids). The content and nutritional role of different minor chemical components of food (minerals and vitamins). The principles and control of enzymic and non-enzymic browning. The composition and use of enzymes in food processing. Microbiological aspects: Introduction to micro-organisms. Intrinsic and extrinsic factors that affect growth and survival of micro-organisms. Important microbial groups in food. Microbial spoilage of foods. Determination of micro-organisms and/or their products in foods. The preservation of foods. Microbial indicators of food safety and quality. Food-borne diseases and intoxications. The utilisation of micro-organisms in food production. Prerequisite: [Third-year status in Food Science or TDH]					
FPP452	FOOD PROCESSING EQUIPMENT AND OPERATIONS 452				
NAS_VDW	VOV485	English	3 + 0	S1	20
Dimensions and units. Introduction to mass and energy balance. Heat transfer theory, Energy for food processing, Fluid flow and rheology, Unit operations including: materials handling, cleaning, sorting and grading, peeling, disintegration, separation, pumping, mixing and forming, heating, concentration, drying, extrusion, cooling.					
Prerequisite: [Third year status in Food Science or TDH]					
FPP461	APPROPRIATE FOOD PRESERVATION TECHNOLOGIES 461				
NAS_VDW	n a	English	2 + 0.5	K3	20
Food security. Post harvest losses (biochemical spoilage, chemical spoilage, physical spoilage, physiological spoilage, microbial spoilage, insects and rodents). Post-harvest					

handling of food (storage, transport and packaging). Appropriate processing and preservation technologies (drying, fermentation, chemical preservation, heat treatment, hurdle technology, milling). Prerequisites: [FST451 GS] and [FST452 GS] or [TDH]					
FPP462	APPROPRIATE FOOD PROCESSING TECHNOLOGIES 462				
NAS_VDW	VOV483	English	2 + 0.5	K3	20
Cereals (milling, fermentation, baking). Oilseeds and legumes (extraction, refining, bleaching, hydrogenation). Fruits and vegetables (drying, canning, pickling). Dairy (fermentation, concentration). Meat (fermentation, drying, canning, smoking and curing). Prerequisites: [FST451 GS] and [FST452 GS] or [TDH]					
FPP463	PROJECT 463				
NAS_VDW	VOV472	English	2 + 0.5	K4	20
Exercise in beneficiating a locally produced agricultural raw material into an added-value food product with an extended shelf life; applying food preservation and processing principles, performing a mass-energy balance and costing of the process. Prerequisites: [FST451 GS] and [FST452 GS] or [TDH]					
FRB711	FINANCIAL RISK MANAGEMENT 711				
EB_FRK	n a	Bilingual	2 + 0	S1	20
Introduction to risk and financial risk; Financial risk exposures; Evolution and use of risk management products; Measurement of internal and external risk through modelling and forecasting; Market (price) risk; Portfolio risk; Value-at-Risk; Capital requirements; Fixed-income risk; Liquidity, operational and legal risks; Credit (default) risk; Regulation (governance) and compliance environment; Firm-wide risk management; Implementing a risk management programme.					
FRB721	FINANCIAL RISK MANAGEMENT 721				
EB_FRK	n a	Bilingual	2 + 0	S2	20
Introduction to derivatives; Mechanics of futures and forward markets; Forward and futures prices; Hedging with futures; Interest rate futures; Swaps; Option contracts and markets; Option trading strategies; Option pricing: Binomial, Black and Scholes; Options on stock indices and foreign currencies; Options on futures; Interest rate options; Option Greeks.					
FRK121	FINANCIAL ACCOUNTING 121				
EB_FRK	n a	Bilingual	4 + 0	S2	12
Elements of financial statements in detail. The conceptual framework. Income statement, balance sheet, cash flow statement and analysis and interpretation of clubs, partnerships close corporations. Introduction to Companies. Prerequisite: [FRK151 GS or FRK152 GS]					
FRK151	FINANCIAL ACCOUNTING 151				
EB_FRK	n a	Bilingual	4 + 0	K1	5
Computer-assisted training: Nature and function of Accounting. Development of Accounting, Financial position, financial result. The recording process. Processing of Accounting data. Elementary income statement and balance sheet. Prerequisite: [Par.1.2]					
FRK152	FINANCIAL ACCOUNTING 152				
EB_FRK	n a	Bilingual	4 + 0	K2	5
Flow of documents. Accounting systems. Introduction to internal control and internal control measures. Bank reconciliations. Control accounts. Adjustments. Financial statements of a sole proprietor.					
FRK181	FINANCIAL ACCOUNTING 181				
EB_FRK	n a	Bilingual	2 + 0	S2	3
Computer processing of accounting information. Prerequisite: [FRK151 Par 1.2]					

FSG110	INTRODUCTORY PHYSIOLOGY 110				
BA_GW	n a	Bilingual	3 + 0	S1	6
Introduction (terminology and anatomical orientation), chemical principles, cell and tissue, neurophysiology and senses, hematology and body fluids, cardiovascular system.					
FSG120	INTRODUCTORY PHYSIOLOGY 120				
BA_GW	n a	Bilingual	3 + 0	S2	6
Respiratory system, nutrition, digestion and metabolism, kidneys and acid-base equilibrium, endocrinology, reproductive systems, skin and body temperature control.					
Prerequisite: [FSG120 GS]					
FSK116	ENGINEERING PHYSICS 116				
NAS_PHY	n a	Double	4 + 1	S1	16
Mathematical introduction, motion in a straight line, vectors, motion in two and three dimensions, forces and motion, kinetic and potential energy, work, collisions, rotation, oscillations, waves.					
Prerequisites: [Par.1.2] and [WTW114 #]					
FSK126	ENGINEERING PHYSICS 126				
NAS_PHY	n a	Double	4 + 1	S2	16
Electric charge, electric fields, Gauss' law, electric potential, capacitance, electric current and resistance, circuits, magnetic fields, induction and inductance, alternating current, electromagnetic waves, mirrors, lenses.					
Prerequisite: [FSK116 GS]					
FST250	INTRODUCTION TO FOOD SCIENCE AND TECHNOLOGY 250				
NAS_VDW	VDW211	English	2 + 1	S1	12
Lectures: How food is produced, processed and distributed (food pipeline). Constituents of foods. Food quality. Food deterioration and control (food preservation). Food safety, risks and hazards. Selected food industries. Principles of food packaging. Food legislation and labelling. Food processing and the environment. Practicals: Group assignments applying the theory in practice; practical demonstrations in pilot plants; guest lecturers on the world of food scientists; factory visit/videos of food processing.					
Prerequisites: [CMY117] and [CMY127] and [MBY161] and [PHY131] and [WTW134] or [TDH]					
FST260	INTRODUCTION TO FOOD SCIENCE AND TECHNOLOGY 260				
NAS_VDW	VDW222	English	2 + 1	S2	12
Lectures: Raw material preparation: storage, cleaning, sorting, grading and peeling. Food conversion processes: emulsification and homogenisation; mixing and forming; mechanical separations). Food preservation technologies: concept of hurdle technology; heat (blanching, pasteurisation and sterilisation); cold (refrigeration and freezing); concentration and dehydration; food irradiation; new methods of food preservation. Practicals: Practical applications of above processes. Physical, chemical and sensory evaluation of processed foods. Assignment: Application of hurdle technology concept to a specific food product.					
Prerequisites: [CMY117] and [CMY127] and [MBY161] or [TDH] and [PHY131] and [WTW134]					
FST350	INTEGRATED FOOD SCIENCE 350				
NAS_VDW	VDW400	English	1 + 0	S1	18
Literature studies and seminar presentations on topics in Food Science.					
Prerequisites: [FST250] and [FST260] or [TDH]					
FST351	FOOD CHEMISTRY - I 351				
NAS_VDW	VDW314	English	4 + 2	K1	18
Lectures – Chemistry of major food components: Carbohydrates, proteins, lipids, water. Chemical and nutritional aspects of food processing: implications of different processing					

<p>techniques on the major food components. Functional properties of the major food components. Modification of functional properties of the major food components. Food analysis methodology. Practical work: Food analysis.</p> <p>Prerequisites: [BCM251] and [BCM252] and [BCM261] and [BCM262] or [TDH]</p>					
FST352	FOOD CHEMISTRY - II 352				
NAS_VDW	VDW324	English	4 + 2	K2	18
<p>Lectures - Basic Food Analysis and Chemistry of the Minor Food Components: Basic food analysis, vitamins, minerals, additives, contaminants. Chemical and nutritional aspects of food processing; implications of different processing techniques on minor food components. Functional properties of the minor food components. Food analysis methodology. Practical work: Food analysis.</p> <p>Prerequisite: [FST351]</p>					
FST360	PLANT FOOD SCIENCE 360				
NAS_VDW	n a	English	2 + 1	S2	18
<p>Fruit and vegetable science: Overview of structure and chemical composition. Nutritional value of fresh fruits and vegetables. Post-harvest physiology and biochemistry. Quality evaluation of fresh produce. Post-harvest handling: storage, packaging and transport. Shelf life extension of fresh produce. Cereal science: Sources of cereal products in the world. Structure and chemistry of cereal grains. Chemistry of wheat proteins. Storage of cereals. Nutritional value of cereals. Dough rheology. Oilseeds and legumes science. Structure and chemistry of the most important legumes and oil seeds (soya beans, peanuts, sunflower seeds). Practical work: Laboratory analyses of components and products of cereals, oilseeds, legumes and fruits and vegetables. Modified atmosphere packaging of fruits and vegetables; determination of quality.</p> <p>Prerequisites: [FST250] and [FST260] and [FST351] and [FST352] or [TDH]</p>					
FST361	ANIMAL FOOD SCIENCE 361				
NAS_VDW	n a	English	4 + 2	K3	18
<p>Dairy Science: Composition of milk; some physical properties of milk; factors affecting composition of milk; microbiological aspects of milk production; lactation; mechanical milking; milk defects; nutritive value of milk and milk products. Practical work: Chemical and microbiological tests of milk. Demonstration of the cheese making process. Meat, poultry, fish and egg science: The composition, nutritional value and quality of meat, poultry, fish and eggs; factors affecting quality from slaughter or harvesting to consumption. Practical work: Visits to red meat and poultry abattoirs; quality determinations, egg quality and protein functionality.</p> <p>Prerequisites: [FST250] and [FST260] and [FST351] and [FST352] or [TDH]</p>					
FST451	ADVANCED FOOD SCIENCE 451				
NAS_VDW	n a	English	2 + 1	S1	20
<p>Lectures: Lectures in advanced level food chemistry, food microbiology, food engineering, food processing and nutrition. Problem solving and literature discussion. Practicals: Advanced techniques of analyses and applications or assignments in food chemistry, food microbiology, food engineering, food processing and nutrition.</p> <p>Prerequisite: [Third-year status in Food Science or TDH]</p>					
FST452	ANIMAL FOOD TECHNOLOGY 452				
NAS_VDW	n a	English	4 + 2	S1	40
<p>Dairy Technology: The technology of fluid, concentrated, dried, frozen and fermented dairy products and starter cultures. Requirements for milk supply and other ingredients. Principles for the manufacturing of products in this category. Possible defects, causes and prevention. Practical work: Preparation of condensed milk, custard, ready-to-eat milk-based desserts, flavoured milk beverages, dairy-fruit juice mixtures; ice cream and other frozen desserts; yoghurt and cultured milk products; cheeses. Evaluation and analysis of</p>					

the products. Factory visits. Meat, poultry, fish and egg technology: Meat, poultry, fish and egg processing and equipment. Meat emulsion, curing, dehydration and fermentation technology. Preservation and storage. Packaging. Legislation. Quality control and hygiene. Practical work: Manufacturing of dried, cured, fermented and emulsion type products. Visits to processing factories.					
Prerequisite: [FST361] or [TDH]					
FST453	RESEARCH METHODOLOGY AND SEMINARS 453				
NAS_VDW	n a	English	2 + 0	S1	20
Lectures and assignments: Research methodology. Literature study and seminar presentations on topics in Food Science and/or Technology.					
Prerequisite: [Third-year status in Food Science or TDH]					
FST461	PRODUCT DEVELOPMENT, QUALITY MANAGEMENT SYSTEMS AND SENSORY ANALYSIS 461				
NAS_VDW	VDW442	English	2 + 1	K3	20
Lectures: Quality management systems with specific reference to Good Manufacturing Practices, HACCP, ISO 9000 systems and Total Quality Management Systems. A study of the consecutive steps followed in the development of new food products. Applications of sensory evaluation. Statistical analysis and interpretation of data. Instrumental quality measurement. Practicals: Product development project (includes implementation of HACCP plan); practical aspects and execution of sensory evaluation techniques, analysis and interpretation of data. Instrumental quality measurements.					
Prerequisites: [FST260] and [FST351] and [FST352] or [TDH]					
FST462	PLANT FOOD TECHNOLOGIES 462				
NAS_VDW	n a	English	4 + 2	S2	40
Fruit and vegetable technology: Extension of shelf life of minimally processed fruits and vegetables. Pre-processing. Processing and preservation: canning, freezing, dehydration, concentration, juice extraction, irradiation and fermentation. Effect of processing on nutritional, sensory and microbiological quality. Practical work: Practical execution of the processes describe above in pilot factory; factory visits; execution and reporting of a practical project on extended shelf life of fresh juice or of minimally processed products. Cereal technology: Dry and wet milling extraction processes. Bread baking technology. Soft wheat products technologies. Malting and brewing technology. Production of RTE (ready to eat) breakfast cereals. Pasta and noodle technology. Alternative uses of cereals. Traditional African cereal products. Practical work: Visits to mills, bakeries and breweries. Experiments to determine the milling and baking quality of wheat. Rheological, chemical and baking tests of wheat. Small scale processing, factory visits, basic analytical methods and quality control of cereal products. Oilseeds and legumes technologies: Processability, functional characteristics and food applications of the most important legumes and oil seeds (soy beans, peanuts, sunflower seeds). Practical work: Visits to food factories; small-scale processing of oilseeds and legumes.					
Prerequisite: [FST360] or [TDH]					
FST463	RESEARCH PROJECT 463				
NAS_VDW	n a	English	1 + 2	S2	20
Planning, execution and reporting of a research project on a selected Food Science and/or Technology subject.					
Prerequisite: [Third-year status in Food Science or TDH]					
GGY132	CARTOGRAPHIC SKILLS 132				
NAS_GGY	GGY132	Bilingual	0 + 1	S1	4
Principles of cartography. Map reading, analysis and interpretation; introductory survey techniques.					
Prerequisite: [Par 1.2]					

GGY153	GEOGRAPHY OF CITIES 153				
NAS_GGY	GGY153	Double	4 + 0	K1	6
An introduction to the forms and functions of cities from ancient times to the 17th Century as a basis for understanding early South African towns. The essence of the segregated and apartheid forms of the modern South African city.					
Prerequisite: [Par 1.2]					
GGY154	GEOGRAPHY OF TOURISM 154				
NAS_GGY	GGY154	Double	4 + 0	K2	6
Geography of tourism: conceptualisation; basic elements; classification; international and South African context; ecotourism: resources; urban tourism.					
Prerequisite: [Par 1.2]					
GGY155	HUMAN GEOGRAPHY OF SADC 155				
NAS_GGY	n a	English	4 + 0	K2	6
Foundations for understanding contemporary human geographic processes in Southern Africa. The course will trace the major changes in the economic, political and population geography of Southern Africa including those associated with the formation of SADC.					
GGY162	REMOTE SENSING 162				
NAS_GGY	GGY162	Bilingual	0 + 1	S2	4
Use, interpretation and analysis of satellite imagery, aerial photography and other remotely sensed data.					
Prerequisite: [Par 1.2]					
GGY163	BIOGEOGRAPHY OF SA 163				
NAS_GGY	GGY163	Double	4 + 0	K3	6
Introduction to the biogeography of South Africa; the environment as ecological system; ecological laws and processes; natural regions and biomes; humans as ecological elements; resource utilisation, management and mismanagement in South Africa.					
Prerequisite: [Par 1.2]					
GGY164	PHYSICAL GEOGRAPHY OF SA 164				
NAS_GGY	GGY164	Double	4 + 0	K4	6
Introduction to the physical geography of South Africa including climate and weather patterns, landscape evolution and topographical distribution. Landscaping processes within arid, semi-arid and coastal environments; fluvial systems and processes; mountain environments.					
GGY252	PROCESS GEOMORPHOLOGY 252				
NAS_GGY	GGY252	English	4 + 2	K2	12
Physical processes that influence the earth's surface and management. Specific processes and their interaction in themes such as weathering; soil erosion; slope, mass movement and fluvial processes.					
GGY263	URBAN MODELLING 263				
NAS_GGY	GGY263	English	4 + 2	K3	12
Theoretical constructs for the single and multi-nodal forms of the western city. Modelling the inter-urban settlement system, and intra-urban tertiary activity. Presentation skills; geographic communication; analysis and statistical interpretation of spatial data.					
GGY264	URBAN SOCIAL MORPHOLOGY 264				
NAS_GGY	GGY264	English	4 + 2	K4	12
The structure and spatial distribution of class, income, ethnicity, age and other demographic variables in urban environments in South Africa and other parts of the world. Qualitative and quantitative analyses of social change and transformation in cities, including segregation, desegregation and gentrification. Other themes include urban perception, urban living, social area analysis, and spatial strategies for social integration.					

GGY283	INTRODUCTORY GIS 283				
NAS_GGY	GGY283	English	4 + 2	K1	12
Introduction to Geographic Information Systems (GIS), types of GIS, data input, data analysis and associated technology. GIS applications and data analysis techniques in practicals comprise concepts presented in lectures. The practical application of GIS is emphasised rather than mastering software.					
GGY353	URBAN DEVELOPMENT STUDIES 353				
NAS_GGY	GGY353	English	4 + 2	K1	18
Relationships between land values and land uses under changing conditions affected by corporations, super corporations, powerful individuals, and local authorities with selected examples from London, Paris, and Johannesburg.					
GGY354	DEVELOPMENT GEOGRAPHY 354				
NAS_GGY	GGY354	English	4 + 2	K2	18
Principles of development, perspectives on development. Aspects of development strategy such as population growth, urbanisation, rural development. Development in Third World cities. Frameworks for development in South Africa.					
GGY361	ENVIRONMENTAL GEOMORPHOLOGY 361				
NAS_GGY	GGY361	English	4 + 2	K3	18
Interactions of geomorphic processes within the physical and built environments; themes such as geomorphology and environmental change, slope processes and the environment, geomorphic risks and hazards, soil erosion and conservation, geomorphology in environmental management, weathering in urban environments, preservation of buildings, and deterioration and preservation of indigenous rock art. Practicals involve fieldwork and subsequent laboratory analysis.					
GGY362	NATURAL RESOURCE MANAGEMENT 362				
NAS_GGY	GGY362	English	4 + 2	K4	18
The biosphere as an environmental system; environmental degradation due to mismanagement; principles and approaches to sustainable resource management; ecosystem management in South Africa; solutions to environmental degradation; terrain potential and impact assessment. Special emphasis is placed on tourism as a land-use.					
GGY363	APPLIED GEOMORPHOLOGY 363				
NAS_GGY	GGY363	English	4 + 0	K3	12
Interactions of geomorphic processes within the physical and built environments. Geomorphology in environmental management, weathering in urban environments, conservation and preservation of buildings. (Course for Landscape Architecture and Architecture students.)					
GIS220	GEOGRAPHIC DATA ANALYSIS 220				
NAS_GGY	GIS220	English	3 + 1	S2	12
Collection, management, analysis and representation of geographic data; data sampling, and preparation; geographic referencing; interpolation; data integration; presentation.					
GIS310	GEOGRAPHIC INFORMATION SYSTEMS 310				
NAS_GGY	GIS310	English	3 + 1	S1	24
Advanced theory and practice of Geographic Information Systems; GIS applications; design and implementation of GIS applications. Prerequisite: [GGY283] or [TDH]					
GIS320	SPATIAL ANALYSIS 320				
NAS_GGY	GIS320	English	3 + 1	S2	24
Introduction to spatial analysis techniques including classification, interpolation, extrapolation, geo-referencing, kriging, topology, visualisation, networks, spatial interaction, spatial statistics and general spatial systems analysis. Prerequisite: [GIS310] or [TDH]					

GKD250	INTRODUCTORY SOIL SCIENCE 250				
NAS_PGW	GKD213	Bilingual	3 + 1	S1	12
Origin and development of soil, weathering and soil formation processes. Profile differentiation and morphology. Physical characteristics: texture, structure, soil water, atmosphere and temperature. Chemical characteristics: clay minerals, ion exchange, pH, buffer action, soil acidification and salinisation of soil. Soil fertility and fertilisation. Soil classification. Practical work: Laboratory evaluation of simple soil characteristics. Field practicals on soil formation in the Pretoria area. Prerequisite: [CMY117 GS] or [TDH]					
GKD260	SOIL FERTILITY AND PLANT NUTRITION 260				
NAS_PGW	GKD228	Bilingual	3 + 1	S2	12
Principles of plant nutrition. Essential plant nutrient elements. Soil as growth medium for plants. Macro and micro element supply to plants. Micro elements. Deficiencies and toxicities. Evaluation of soil fertility. Practical work: Laboratory evaluation of soil fertility. Pot experiments in a glass house. Prerequisite: [GKD250 GS]					
GKD270	SOIL SCIENCE 270				
NAS_PGW	GKD215	Afrikaans	2 + 0.5	S1	6
The appearance and characteristics of soils (a course for students in Agricultural Engineering). Prerequisite: [CMY117 GS]					
GKD350	SOIL CLASSIFICATION AND SURVEYING 350				
NAS_PGW	GKD317	Bilingual	3 + 1	S1	14
A taxonomic system for South Africa. USDA's Soil Taxonomy. Land suitability evaluation. Optimal resource utilization. The conservation component. Ecological aspects. Ecotope, land types. Soil maps. Practical work: Field practicals and compulsory excursion. Identification of soil horizons, forms and families. Land suitability evaluation. Elementary mapping exercise. Prerequisite: [GKD250 GS]					
GKD351	SOIL PHYSICS 351				
NAS_PGW	GKD329	Bilingual	2 + 0.5	K1	7
A study of some soil physical properties of soil: structure, texture, compacting and crusting. Sedimentation and sieve analyses for the determination of particle sizes. Conduction of heat. Practical work: Determination of some physical properties of soil. Prerequisite: [GKD250]					
GKD370	SOIL CHEMISTRY 370				
NAS_PGW	GKD318	Bilingual	2 + 1	S1	14
The more exact chemistry of soils systematically explained by understanding the particular chemical principles. Charge origin. Chemical equilibriums. Manifestations of sorption. Ion exchange. Acidic soils, saline soils and the organic fraction of soil. The chemistry of the important plant nutrient elements P, K and N. Prerequisite: [GKD250]					
GKD430	LAND SUITABILITY EVALUATION 430				
NAS_PGW	GKD485	Bilingual	3 + 1	S1	14
Principles of land suitability evaluation; some important land suitability evaluation systems; concepts such as soil potential, ecotope, land types etc. Soil requirements and tolerances for some important soil uses. Prerequisite: [GKD250]					
GKD450	SOIL MINERALOGY AND SOIL GENESIS 450				
NAS_PGW	GKD415	Bilingual	2 + 1	S1	14
Pedogenetic processes. Soil forming factors. Clay mineralogy: Structure, nomenclature, classification and synthesis of clay minerals. Prerequisite: [GKD250]					

GKD460	ENVIRONMENTAL MANAGEMENT 460				
NAS_PGW	PGW411+GKD414	Bilingual	2 + 1	S2	14
Chemical, physical and biological soil degradation (with the emphasis on pollution); types, causes, effects, combating. Biogeochemical element cycles. Sewage. Acid rain. Pesticides. Aspects of soil erosion. Environmental impact studies as well as planning, implementation and auditing of environmental management plans. Strip and open cast mining. Management of catchments, desertification, modifications of global environment, control of invasive exotics, bush encroachment and pollution of air and water. Practical work: Studies on the aspects of lectures.					
Prerequisite: [GKD250]					
GKD480	RESOURCE SURVEYS 480				
NAS_PGW	GKD487	Bilingual	3 + 1	S2	14
Techniques for the execution of detailed soil surveys (including fieldwork and the composition of maps and reports); analysis of climatic data; field and capacity evaluation; analysis of water resources. Practical exercises in all of these aspects. Prerequisite: [GKD250]					
GLY151	INTRODUCTION TO GEOLOGY 151				
NAS_GLY	GLY112	English	4 + 1	K1	8
Solar system; structure of solid matter; minerals and rocks; introduction to symmetry and crystallography; important minerals and solid solutions; rock cycle; classification of rocks. Crystal models, mineral and rock samples. Prerequisite: [Par.1.2]					
GLY152	PHYSICAL GEOLOGY 152				
NAS_GLY	GLY113	English	4 + 1	K2	8
External geological processes (gravity, water, wind, sea, ice) and their products (including geomorphology). Internal structure of the Earth. The dynamic Earth – volcanism, earthquakes, mountain building – the theory of plate tectonics. Geological processes (magmatism, metamorphism, sedimentology, structural geology) in a plate tectonic context. Geological maps and rock specimens. Prerequisite: [Par.1.2]					
GLY161	HISTORICAL GEOLOGY 161				
NAS_GLY	GLY123	Bilingual	4 + 1	K3	8
Principles of stratigraphy and stratigraphic nomenclature; geological dating and international and SA time scales; African framework and tectonic elements of SA; introduction to depositional environments. Overview of the historical geology of SA, from the Archaean to the present: major stratigraphic units, intrusions and tectonic-metamorphic events – their rock types, fossil contents, genesis and economic commodities. Principles of palaeontology and short description of major fossil groups: fossil forms, ecology and geological meaning. Geological maps and profiles; rock and fossil samples.					
GLY162	ENVIRONMENTAL GEOLOGY 162				
NAS_GLY	n a	English	4 + 1	K4	8
Geological processes and their influence on man's environment: earthquakes, volcanoes, slope movement, subsidence, floods, coastal processes, meteorite impacts, atmospheric changes. Natural resource utilization and the impact of man on the geological environment: urban development, dams, mining, agriculture, transport systems, heavy structures, construction materials, groundwater extraction, waste disposal, environmental pollution. Geological maps, profiles and rock specimens.					
Prerequisites: [GLY151 GS] and [GLY152 GS]					
GLY251	CRYSTAL OPTICS AND CRYSTAL CHEMISTRY 251				
NAS_GLY	GLY214	English	4 + 2	K1	12
The properties of light in isotropic and anisotropic solids; the polarizing microscope; nature and identification of isotropic, uniaxial and biaxial crystals in transmitted and reflected light. Atoms and atomic structure; crystal structure and crystal field theory.					
Prerequisites: [CMY117 GS] and [GLY151]					

GLY252	MINERALOGY 252				
NAS_GLY	n a	English	4 + 2	K2	12
Phase rule of Willard Gibbs. Phase diagrams in pressure-temperature-compositional space. One- and two-component systems. Systematic review of the major rock-forming silicate, sulphide and oxide minerals in terms of optical properties, crystal structure, crystal chemistry, pressure-temperature conditions of formation, alteration and association in rock systems. Optical identification and description of minerals and their mutual relationships in thin section.					
Prerequisite: [GLY251 GS]					
GLY253	SEDIMENTOLOGY 253				
NAS_GLY	GLY215	Bilingual	4 + 2	K2	12
Introduction to sedimentology; grain studies; composition and textures of sedimentary rocks; flow dynamics and behaviour of sediment particles in transport systems; description and genesis of sedimentary structures; diagenesis; depositional environments and their deposits, modern and ancient; chemical sedimentary rocks; economic sedimentology; field data acquisition from sedimentary rocks and writing of reports; sieve analysis; Markov analysis; analysis of palaeocurrent trends; interpretation of sedimentary profiles.					
Prerequisite: [GLY152]					
GLY254	STRUCTURAL GEOLOGY 254				
NAS_GLY	GLY216	Bilingual	4 + 2	K1	12
Integrated theoretical and practical course dealing with the principles of rock deformation and analysis of deformed rocks. Stress, strain and rheology; fault systems, reactivation of faults, inversion tectonics, balanced cross sections; folds, interference (superposed) folds; tectonic fabrics; shear zones, progressive deformation; mapping and analysis of deformed rocks; regional tectonics.					
Prerequisite: [GLY152]					
GLY261	METAMORPHIC PETROLOGY 261				
NAS_GLY	GLY316	English	4 + 2	K3	12
Classification of metamorphic rocks. Anatexis, migmatite and granite; eclogite. Metamorphic textures. PT-time loops. Metamorphism in various plate tectonic environments.					
Prerequisite: [GLY252]					
GLY262	METAMORPHIC PETROLOGY 262				
NAS_GLY	GLY316	English	4 + 2	K4	12
Classification of metamorphic rocks. Anatexis, migmatite and granite; eclogite. Metamorphic textures. PT-time loops. Metamorphism in various plate tectonic environments. Prerequisite: [GLY252]					
GLY263	STRATIGRAPHY AND ENGINEERING GEOLOGY 263				
NAS_GLY	n a	Bilingual	4 + 2	K3	12
The crustal development of Southern Africa and the geomorphologic history of the Post-Gondwana era. The engineering geological properties and problems associated with the different lithostratigraphic units occurring in Southern Africa. Mapping techniques.					
Prerequisite: [TDH]					
GLY264	INTRODUCTION TO GEOPHYSICS 264				
NAS_GLY	n a	Bilingual	4 + 2	K4	12
Physical properties of rocks and minerals relevant to exploration geophysics: porosity and permeability; density; magnetic properties; natural radioactivity; elastic properties; seismic wave attenuation; thermal properties; electrical properties. Basic principles and applications of various geophysical techniques: gravity, magnetic, resistivity, electromagnentic, seismic and radiometric techniques. Mapping techniques.					
Prerequisite: [TDH]					

GLY351	GROUNDWATER 351				
NAS_GLY	n a	Bilingual	4 + 2	K1	18
Origin and classification of groundwater; classification of aquifers; groundwater movement; equations for groundwater flow into boreholes; the La Place equation and solutions for pump tests; execution and interpretation of pump tests. Groundwater flow modelling; classification of aquifers in Southern Africa; groundwater exploration and management. Mapping.					
Prerequisite: [GLY264] or [TDH]					
GLY352	ORE FORMATION 352				
NAS_GLY	GLY323(gedeeltelik)	English	4 + 2	K2	18
Principles of ore forming processes and geological environments of ore formation; classification schemes; exploration models; economic factors; valuable by-products; market fluctuations; resources and their renewability. Mapping.					
Prerequisites: [GLY261] and [GLY262] or [TDH]					
GLY361	ORE DEPOSITS 361				
NAS_GLY	GLY323(gedeeltelik)	English	4 + 2	K3	18
Systematic review of major metallic and non-metallic ore types and examples in South Africa and world-wide; ore type models (grades, tonnages); geometry of ore bodies; mining. Ore samples and ore mineralogy.					
Prerequisite: [GLY352] or [TDH]					
GLY362	GEOSTATISTICS AND ORE RESERVE CALCULATIONS 362				
NAS_GLY	GLY323(gedeeltelik)	Bilingual	4 + 2	K4	18
Review of classical geostatistical methods; problem evaluation; descriptive statistics, normal, lognormal, three-parameter lognormal distributions; confidence intervals; student-t. Sampling; cut-off values; grid generation and trend-surface analysis. Semivariogram; error estimation; Kriging (BLUE) techniques. Ore reserve calculations.					
GMA220	REMOTE SENSING AND GPS 220				
NAS_GGY	n a	English	3 + 1	S2	16
The electromagnetic spectrum, vertical aerial photographs, satellite images, stereoscopic images and image interpretation. Photo mosaics and ortho photographs.					
Prerequisite: [GPS220] or [TDH]					
GMA320	REMOTE SENSING 320				
NAS_GGY	n a	English	3 + 1	S2	24
The theory and application of satellite image analysis, transformation and classification. Interpretation and manipulation of digital photography.					
Prerequisites: [GMA220] and [WST161] and [WST162]					
GMC110	CARTOGRAPHY 110				
NAS_GGY	n a	English	3 + 0	S1	8
An overview of the development of cartography, the concepts, processes, techniques and data sources. Prerequisite: [GGY132]					
GMC210	CARTOGRAPHY 210				
NAS_GGY	n a	English	3 + 1	S1	12
Rules of graphical communication and the depiction of spatial data. Graphical elements of design and symbolisation and visualisation of spatial referenced data in application areas such as sociology, economics, environmental management, etc.					
Prerequisite: [GMC110]					
GMC310	CARTOGRAPHY 310				
NAS_GGY	n a	English	3 + 1	S1	24
The traditional and digital approaches to cartographic design and user/supplier requirements. Evaluation of the cartographic processes for applicability. The functionality					

of digital mapping programs and the cartographic software of Geographic Information Systems.					
Prerequisite: [GMC210]					
GMT320	GEOINFORMATICS PROJECT 320				
NAS_GGY	na	English	3 + 1	S2	24
A project which is approved by the lecturer and in which one or more of the studied techniques of data acquisition and processing are used to produce an output of spatially referenced information. The project must be fully described in a project report.					
Prerequisite: [GIS310] or [TDH]					
GPH351	GRAVITY 351				
NAS_GLY	na	Bilingual	4 + 2	K1	18
Basic definitions and units; gravity potential; measurement of gravity; gravity field of the earth; spheroid and geoid. Reduction of gravity values; Bouguer anomaly values; residual gravity anomalies; isostasy; terrain corrections; field surveys, data presentation; filter and contour techniques; rock densities; interpretation techniques and algorithms; computer interpretations.					
GPH352	APPLIED NUMERICAL METHODS 352				
NAS_GLY	GPH311	Bilingual	4 + 2	K2	18
Numerical techniques: interpolation, integration, Fourier analysis, filter design and differentiation. Special emphasis on geophysical applications. Prerequisite: [TDH]					
GPH361	POTENTIAL FIELD METHODS I 361				
NAS_GLY	GPH312(gedeeltelik)	Bilingual	4 + 2	K3	18
Gravity potential field theory, instrumentation, field procedure, data reduction and interpretation of gravity data. Geo-electrical methods, apparent resistivity, layered earth response, calculation of theoretical depth sounding curves, graphical interpretation, computer interpretation. Prerequisite: [TDH]					
GPH362	POTENTIAL FIELD METHODS II 362				
NAS_GLY	GPH312(gedeeltelik)	Bilingual	4 + 2	K4	18
Geo-electrical methods: equivalence, suppression, field survey, horizontal profiling, self potential (SP), induced polarization (IP). Magnetic methods: potential field theory, instrumentation, field procedure, data reduction and interpretation of magnetic data. Reduction, manipulation and interpretation of aeromagnetic data. Prerequisite: [TDH]					
GSS351	FAMILY STUDIES 351				
NAS_VBR	GSS310	Afrikaans	2 + 0	K3	4
Roles, responsibilities and development tasks of family members during the life cycle. Prerequisite: [Prescribed Psychology and Sociology modules up to 200 level]					
GSS351	FAMILY STUDIES 351				
NAS_VBR	GSS310	Afrikaans	2 + 0	K1	4
Roles, responsibilities and development tasks of family members during the life cycle. Prerequisite: [Prescribed Psychology and Sociology modules up to 200 level]					
GSS352	FAMILY STUDIES 352				
NAS_VBR	GSS310	Afrikaans	2 + 0	K4	4
Family studies applied to aspects of food, nutrition, clothing, housing. GSS 351 and GSS 352 are offered in English in alternative terms in the part-time study programme. Prerequisite: [Prescribed Psychology and Sociology modules up to 200 level]					
GSS352	FAMILY STUDIES 352				
NAS_VBR	GSS310	Afrikaans	2 + 0	K2	4
Family studies applied to aspects of food, nutrition, clothing, housing. GSS 351 and GSS 352 are offered in English in alternative terms in the part-time study programme. Prerequisite: [Prescribed Psychology and Sociology modules up to 200 level]					

GTS124	GENETIC BASIS OF LIFE 124				
NAS_GTS	GTS124	English	4 + 1	S2	16
Basic principles in Genetics: introductory cytogenetics, cell division, Mendelian patterns of inheritance, dominance interactions, genetic linkage and mutations. Probability studies. Introduction to human genetics. Molecular structure of DNA, gene activity and regulation. Basic concepts of population genetics. Introductory plant breeding and breeding strategies. Recombinant DNA and biotechnology.					
Prerequisite: [This module may not be taken by students registered for a BSc degree.]					
GTS161	INTRODUCTORY GENETICS 161				
NAS_GTS	GTS122	Double	4 + 1	K4	8
Principles of Mendelian inheritance: concepts such as locus and allele, dominance interactions and epistasis. Introductory cytogenetics, the karyotype and cell division. Probability studies. Genetic linkage and chromosome mapping. Sex determination and sex linked traits. Inheritance of cytoplasmic DNA and cytoplasmic effects.					
Prerequisite: [MLB111 GS] or [TDH]					
GTS251	GENE AND CHROMOSOME ORGANIZATION 251				
NAS_GTS	GTS215enGTS217	English	4 + 1	K2	12
The molecular structure, organization and packaging of DNA up to the chromosome level, variation in chromosome morphology. Replication, expression and regulation of genetic material. Mechanisms for generating genetic variation (recombination, mutation and transposition). Prerequisite: [GTS161 GS] or [TDH]					
GTS261	GENETIC ANALYSIS AND MANIPULATION 261				
NAS_GTS	GTS225enGTS226	English	4 + 1	K4	12
Creation of variation in micro organisms: transformation, conjugation and transduction. Basic concepts of recombinant DNA technology and its applications in gene analysis and manipulation. Introduction to genetic analysis of populations: allele and genotypic frequencies, breeding systems and quantitative inheritance.					
Prerequisite: [GTS161 GS] or [TDH]					
GTS351	EUKARYOTIC GENE CONTROL AND DEVELOPMENT 351				
NAS_GTS	GTS325	English	2 + 1	S1	18
Regulation of gene expression in eukaryotes: regulation at the genome, transcription, RNA processing and translation levels. Applications of the principles of gene control: cancer, development and differentiation of plants and animals. Aspects of the epigenetic control of gene expression.					
Prerequisites: [GTS251 GS] and [GTS261 GS] or [TDH]					
GTS352	GENOMES 352				
NAS_GTS	n a	English	2 + 1	S1	18
Analysis of the genome as central entity in molecular genetics. Comparison of the molecular organization of prokaryote and eukaryote genomes, differences between the nuclear and mitochondrial genomes. Genome organization in different organisms; gene families, overlapping genes, pseudogenes, DNA repeat content. Genetic techniques for genome mapping, physical mapping, genome sequencing and the localization of genes. Processing of DNA sequencing data using computer technology.					
Prerequisites: [GTS251 GS] and [GTS261 GS] or [TDH]					
GTS353	ADVANCED POPULATION GENETICS 353				
NAS_GTS	GTS326	English	4 + 1	K2	18
Genetic variation and mating systems. Allele frequency change: genetic drift, natural and kin selection, mutation and migration. Molecular evolution: nucleotide substitutions to multigene families, and the neutral theory. Quantitative genetics: analysis of genetic variation, heritability, artificial selection and breeding programmes.					
Prerequisites: [GTS251 GS] and [GTS261 GS] or [TDH]					

GTS361	HUMAN GENETICS 361				
NAS_GTS	GTS314	English	2 + 1	S2	18
Human karyotype. Pedigree analysis and the inheritance of single gene traits in humans, concepts such as X-chromosome inactivation, expressivity, genetic imprinting. Genetic differentiation of sex and sex chromosome abnormalities. Cytogenetic and molecular basis of genetic diseases, molecular diagnostics and genetic counselling. Genetics of the immune system. Gene therapy as a treatment for genetic defects. Ethical aspects. Prerequisites: [GTS251 GS] and [GTS261 GS] or [TDH]					
GTS362	INTRODUCTION TO PLANT BREEDING 362				
NAS_GTS	GTS316	English	4 + 1	K3	18
Genetic systems, recombination and variability. Population structure and variability. Sources of variation including induced mutations, hybridization and chromosome manipulation. Assessment of variation. Manipulation of genetic systems: incompatibility systems, male sterility, asexual systems, as well as cell and tissue cultures. Prerequisites: [GTS251 GS] and [GTS261 GS] or [TDH]					
GTS363	EVOLUTIONARY AND PHYLOGENETICS 363				
NAS_GTS	n a	English	2 + 1	S2	18
Origin of life's code. Molecular evolution and analytical tools. Determining the molecular ecology and evolutionary history of populations and species, and its applications in conservation, medical sciences and human evolution. Optimality, phylogenetic and molecular studies of adaptation; Evolution of sexual reproduction, resistance and virulence, and its practical applications; Evolutionary arms races. Prerequisites: [GTS251 GS] and [GTS261 GS] or [TDH]					
GTS451	SEMINAR AND TECHNIQUES COURSE 451				
NAS_GTS	GTK401enGTK403	English	4 + 1	K2	18
Techniques course: molecular techniques, plant tissue culture and transformation, DNA genotyping and analysis, hybridization techniques. Seminars and literature discussion: writing and presentation of seminars, article discussion groups. Prerequisite: [GTS352 GS] or [TDH]					
GTS452	ADVANCED PLANT BREEDING 452				
NAS_GTS	GTK402	English	4 + 1	K1	18
Selection methods: selection strategies, choice of breeding methods and applications. Marker-assisted selection: trait/gene linked markers, application of markers in backcross-breeding. Mapping quantitative characters; gametophytic and sporophytic selection; in vitro selection. Adaptation: genotype x environment interaction, modelling. Prerequisite: [GTS362 GS] or [TDH]					
GTS461	PLANT BREEDING STRATEGIES 461				
NAS_GTS	GTS442	English	4 + 1	K3	18
Specific breeding strategies. Breeding for specific traits. Biotechnology: approaches and available techniques, role of gene technology in plant breeding. Ethical aspects. Comprehensive plant breeding strategies. Population growth, world food supply and sustainable agriculture, role of plant breeding. Prerequisite: [GTS452 GS] or [TDH]					
GTS462	APPLICATIONS IN PLANT BREEDING 462				
NAS_GTS	GTK403	English	1 + 2	K4	18
Research project related to specific breeding strategies: cereals, forestry species, horticulture and floriculture. Prerequisite: [GTS452 GS] or [TDH]					
GTX351	ENGINEERING GEOLOGY 351				
NAS_GLY	GTX321	Bilingual	4 + 2	K1	18
Definition and scope of Engineering Geology; properties and use of rock material; engineering properties of rock masses; origin of soil and description of the soil profile;					

engineering properties and use of soils; stages and methods of geotechnical site investigation, report writing.					
Prerequisites: [GLY262] and [GLY264] or [TDH]					
GTX361	SOIL MECHANICS 361				
NAS_GLY	GTX312	Bilingual	4 + 2	K3	18
<i>Capita selecta</i> from SGM322.					
GVK420	LARGE STOCK SCIENCE 420				
NAS_VKU	n a	Afrikaans	2 + 0.5	S2	12
Industrial science and management of large stock. Revision of the principles of agricultural management. Aspects of business management of the large stock enterprise. Management programmes, production systems and techniques applicable to beef cattle, dairy cattle and horses. Design and planning of farm buildings and structures. Storage and handling of fodder. The handling and management of refuse. Hygiene and herd health programmes.					
Prerequisites: [LEK210] and [RPL320] and [VGE301] and [VKU210] and [VNE361]					
HBS451	RESOURCE MANAGEMENT 451				
NAS_VBR	HBS410	Afrikaans	2 + 0	K3	4
The household as a management unit.					
Prerequisite: [Fourth year status]					
HBS451	RESOURCE MANAGEMENT 451				
NAS_VBR	HBS410	Afrikaans	2 + 0	K1	4
The household as a management unit.					
Prerequisite: [Fourth year status]					
HBS452	RESOURCE MANAGEMENT 452				
NAS_VBR	HBS410	Afrikaans	2 + 0	K4	4
Optimal use of resources.					
Prerequisite: [GS 40% in HBS451]					
HBS452	RESOURCE MANAGEMENT 452				
NAS_VBR	HBS410	Afrikaans	2 + 0	K2	4
Optimal use of resources.					
Prerequisite: [GS 40% in HBS451]					
HBS461	RESOURCE MANAGEMENT 461				
NAS_VBR	HBS420	Afrikaans	2 + 0	K1	4
The family as an economic unit.					
Prerequisite: [Fourth-year status]					
HBS461	RESOURCE MANAGEMENT 461				
NAS_VBR	HBS420	Afrikaans	2 + 0	K3	4
The family as an economic unit.					
Prerequisite: [Fourth-year status]					
HBS462	RESOURCE MANAGEMENT 462				
NAS_VBR	HBS420	Afrikaans	2 + 0	K2	4
Personal and household financial management.HBS 451, 452, 461 AND 462 is available in English during the part-time programme.					
Prerequisite: [Fourth-year status]					
HBS462	RESOURCE MANAGEMENT 462				
NAS_VBR	HBS420	Afrikaans	2 + 0	K4	4
Personal and household financial management.HBS 451, 452, 461 AND 462 is available in English during the part-time programme.					
Prerequisite: [Fourth-year status]					

HSC252	CROP PROPAGATION 252				
NAS_PGW	TBK221	Bilingual	3 + 1	K2	6
<p>Propagation by seed: seed development, including pollination, fertilisation, embryogenesis fruit and seed development; principles and techniques of seed production; seed physiology; principles and practical aspects of seed germination; seed testing and legislation. Vegetative propagation: principles and techniques of rooting/cuttings; budding and grafting; propagation using specialized organs; micro propagation (tissue culturing). Students will get hands-on experience and will visit companies and nurseries.</p> <p>Prerequisite: [BOT161 or BLG150]</p>					
HSC261	TREE GROWTH AND DEVELOPMENT 261				
NAS_PGW	TBK221	English	2 + 0.5	K3	6
<p>Morphology and growth of fruit trees; flowering, pollination, fruit set, dormancy, chilling requirements; seasonal patterns of vegetative and reproductive growth; plant manipulation (rootstock, pruning, thinning, fertilization; hormones and growth regulators); orchard planning and management; crop maturity, harvest, and post-harvest storage.</p> <p>Prerequisites: [GKD250] and [GKD260 #] and [HSC252]</p>					
HSC350	CITRICULTURE 350				
NAS_PGW	TBK410	Bilingual	3 + 1	S1	14
<p>Climatic requirements, cultivation regions, economic importance. Commercially important cultivars and rootstocks, scion/rootstock interactions: influence on vegetative growth and fruit quality. Fruit morphogenesis studied anatomically and morphologically. The effect of fertilization and irrigation on seasonal vegetative and reproductive phenology, as well as reserve status. Diseases and pests important for economic reasons. The module includes an excursion to production regions. Prerequisites: [HSC252] and [HSC261] and [PPK251]</p>					
HSC351	NURSERY MANAGEMENT 351				
NAS_PGW	STZ311	Bilingual	2 + 0.5	K1	8
<p>The nursery industry in South Africa. Greenhouse environmental control. Requirements for soil based and soil-less growing media. The production of plants in a nursery. Management, economical and marketing aspects of different nursery operations. Practical experience on the experimental farm or in nurseries of own choice is compulsory for all participants in this module.</p>					
HSC352	ORNAMENTALS UNDER PROTECTION 352				
NAS_PGW	STZ320	Bilingual	2 + 0.5	K2	7
<p>Economic importance of cut flowers and pot plants. Taxonomy and plant description. Climatic requirements and production practices including establishing, growth manipulation, nutritional requirements, irrigation, pest and disease control, harvest and post-harvest handling. Excursions to nurseries and practical experience on the experimental farm is compulsory for all participants in this module.</p> <p>Prerequisite: [HSC351]</p>					
HSC362	DECIDUOUS POMOLOGY 362				
NAS_PGW	TBK320	English	2 + 0	K4	7
<p>Pome fruits, stone fruits, berries, and nuts: economic importance, production areas internationally and nationally, origin and classification, climate requirements, cultivars and rootstock, cultural and management practices, harvest and handling. An excursion to production areas is compulsory. Prerequisites: [HSC261] and [PPK251]</p>					
HSC450	SUBTROPICAL POMOLOGY 450				
NAS_PGW	TBK314	Bilingual	2 + 0.5	S1	14
<p>Integration of the seasonal phenology of subtropical fruit crops with management systems through a study of the appropriate botany, biochemistry and physiology, as well as climate, soil, water and diseases, in order to achieve the maximum yield, quality and profit.</p> <p>Prerequisites: [HSC252] and [HSC261] and [PPK251]</p>					

HSC451	ORNAMENTALS FOR LANDSCAPING 451				
NAS_PGW	N/A	Bilingual	2 + 1	K1	7
Identification of ornamental plants for commercial and landscape use. Climatic, reproduction and maintenance requirements of abovementioned trees, palms, shrubs, flowering plants, ground covers, climbers and indoor plants. Functional and aesthetic value of plants in a landscape or indoors. Practical experience on the experimental farm is compulsory for all participants in this module.					
HSC460	PRODUCTION SYSTEMS IV: SUBTROPICAL FRUIT PRODUCTION 460				
NAS_PGW	HSC483	English	2 + 0.5	S2	6
Integration of the seasonal phenology of subtropical fruit crops with management systems through a study of the appropriate botany of the crop, its biochemistry and physiology, as well as the influence of climate, soil, water, diseases and pests, in order to achieve the maximum yield, quality and profit.					
HSC470	PRODUCTION SYSTEMS III: TEMPERATE FRUIT PRODUCTION 470				
NAS_PGW	HSC484	English	2 + 0	S1	6
Integration of seasonal phenology of temperate fruit crops with management systems through a study of the appropriate botany, biochemistry and physiology, as well as climate, soil, water and diseases, in order to achieve the maximum yield, quality and profit. Prerequisites: [HSC252] and [HSC261] and [PPK251]					
IAS251	FINANCIAL MATHEMATICS 251				
NAS_VWT	VWT210	Bilingual	4 + 2	K1	12
Mathematical theory of interest rates and the equation of value, annuities, nominal interest rates payable p times per time unit, discounted cash flows, loan schedules, project evaluation, evaluation of fixed interest securities, unitised funds. Prerequisites: [WTW114] and [WTW126] and [WTW128]					
IAS252	LIFE CONTINGENCIES 252				
NAS_VWT	VWT210	Bilingual	4 + 2	K2	12
Mortality table, mortality rate, the lx-function, calculation of annuities, insurances and accumulations. Sickness functions. Life contingency formulae for frequencies other than yearly, policy values, surrender and paid-up values, bonuses and special policies. Prerequisite: [IAS251]					
IAS261	LIFE ASSURANCE PRACTICE IN THE RSA 261				
NAS_VWT	VWT220	Bilingual	3 + 0	K3	12
Structure of an organisations in the life assurance industry, products, law, tax, personal financial planning. Prerequisites: [IAS251] and [IAS252]					
IAS262	LIFE ASSURANCE PRACTICE IN THE RSA 262				
NAS_VWT	VWT220	Bilingual	3 + 0	K4	12
Life assurance policy design and rating, policy values and alterations, actuarial valuation, surplus, reinsurance, investment of life assurance funds. Prerequisites: [IAS251] and [IAS252]					
IAS351	SHORT-TERM INSURANCE PRACTICE IN THE RSA 351				
NAS_VWT	VWT310	Bilingual	3 + 0	K1	18
Structure of and organisations in the industry, law, types of insurance, Lloyds, risk management. Prerequisites: [IAS251] and [IAS252]					
IAS352	SHORT-TERM INSURANCE PRACTICE IN THE RSA 352				
NAS_VWT	VWT310	Bilingual	3 + 0	K2	18
Short-term insurance rating, reserving, reinsurance, investment of short-term insurance funds. Prerequisites: [IAS251] and [IAS252]					

IAS361	RETIREMENT FUND PRACTICE IN THE RSA 361				
NAS_VWT	VWT320	Bilingual	3 + 0	K3	18
Structure of and organisations in the industry, instruments, typical benefits, law, tax, retirement fund design. Prerequisites: [IAS251] and [IAS252]					
IAS362	RETIREMENT FUND PRACTICE IN THE RSA 362				
NAS_VWT	VWT320	Bilingual	3 + 0	K4	18
Retirement fund design, financing, role of the actuary, investment of funds, group insurance. Prerequisites: [IAS251] and [IAS252]					
IGB220	ENGINEERING MANAGEMENT 220				
ING_ING	n a	Bilingual	2 + 0	S2	10
Business Management, Human Resources Management, Technology and Innovation, Decision Analysis, Systems Engineering, Manufacturing.					
INB361	INTERIOR PLANNING 361				
NAS_VBR	INT321	Afrikaans	1 + 1	K3	6
The planning and arrangement of existing living and working spaces to provide for the various needs of the individual, family or group. Prerequisites: [ITW351] and [ITW352] and [OBG152]					
INB362	INTERIOR PLANNING 362				
NAS_VBR	INT321	Afrikaans	1 + 1	K4	6
Evaluation of floor plans; arrangement of furniture. Prerequisite: [INB361]					
INF112	INFORMATICS 112				
EB_INF	n a	Bilingual	3 + 0	S1	10
Introduction to information systems; Information systems in organizations; Hardware: Input, Processing, Output; Software: Systems and Application Software, organization of data and information, telecommunications and networks, the Internet and Intranet. Transaction processing systems, management information systems, decision support systems, information systems in business and society, systems analysis, systems design, implementation, maintenance and revision. Prerequisite: [Par.1.2]					
INF153	INFORMATICS 153				
EB_INF	n a	Bilingual	2 + 0	S1	5
General systems theory, creative problem solving, soft systems methodology. Prerequisite: [Par.1.2]					
INF154	INFORMATICS 154				
EB_INF	n a	Bilingual	1 + 2	S1	5
Introduction to programming. Prerequisite: [Par.1.2]					
INF163	INFORMATICS 163				
EB_INF	n a	Bilingual	2 + 0	S2	5
The systems analyst, systems development building blocks, systems development, systems analysis methods, process modelling. Prerequisite: [INF153 GS]					
INF164	INFORMATICS 164				
EB_INF	n a	Bilingual	1 + 2	S2	5
Advanced programming, use of a computer-aided software engineering tool. Prerequisite: [INF154 GS]					

INF214	INFORMATICS 214				
EB_INF	n a	Bilingual	3 + 1	S1	14
Development design, rational model, structured query language (SQL), entity relationship modelling, normalization, database development life cycle, practical introduction to database design. Databases: Advanced entity relationship modelling and normalization, object-orientated databases, database development life cycle, advanced practical database design.					
Prerequisites: [CIL171] and [CIL172] and [CIL173] and [CIL174]					
INF253	INFORMATICS 253				
EB_INF	n a	Bilingual	2 + 3	S1	9
Systems analysis, systems design: construction, application architecture, input design, output design, interface design, use of computer-aided development tools, programming.					
INF263	INFORMATICS 263				
EB_INF	n a	Bilingual	2 + 3	S2	9
Systems design: internal controls, program design, object design; project management, system implementation, use of computer-aided development tools, advanced programming.					
INK151	INTERIOR MERCHANDISE PRODUCTION 151				
NAS_VBR	KLK120	Afrikaans	1 + 1	K1	6
Basic construction techniques applied in constructing selected interior products.					
INK152	INTERIOR MERCHANDISE PRODUCTION 152				
NAS_VBR	KLK120	Afrikaans	1 + 1	K2	6
More advanced construction and sewing techniques; use of various sewing machines and materials in the construction of interior products.					
Prerequisite: [INK151]					
INK261	INTERIOR MERCHANDISE PRODUCTION 261				
NAS_VBR	n a	Afrikaans	1 + 1	K3	6
Evaluation of ready-made interior products; measuring, planning and construction of custom-made interior products: window coverings. Prerequisite: [INK152]					
INK262	INTERIOR MERCHANDISE PRODUCTION 262				
NAS_VBR	n a	Afrikaans	1 + 1	K4	6
Evaluation of ready-made interior products; measuring, planning and construction of custom-made interior products: soft furnishings. Prerequisite: [INK261]					
INK351	INTERIOR MERCHANDISE PRODUCTION 351				
NAS_VBR	n a	Afrikaans	1 + 1	K1	6
Advanced project: practical involvement in a small business environment. Upholstery.					
Prerequisite: [INK262]					
INK352	INTERIOR MERCHANDISE PRODUCTION 352				
NAS_VBR	n a	Afrikaans	1 + 1	K2	6
A study of fashion and market trends in interior textile products. Development of a sample file. Exposure to mass production of selected interior products.					
Prerequisite: [INK351]					
INK451	INTERIOR MERCHANDISE PRODUCTION 451				
NAS_VBR	n a	Afrikaans	1 + 1	K1	6
Practical work and consumer facilitation in collaboration with the industry.					
Prerequisite: [INK352]					
INK452	INTERIOR MERCHANDISE PRODUCTION 452				
NAS_VBR	n a	Afrikaans	1 + 1	K2	6
Interior assignment in collaboration with the industry. Practical experience in consumer facilitation. Prerequisite: [INK451]					

ITP461	PROJECT: INTERIOR MERCHANDISE 461				
NAS_VBR	HHK480	Afrikaans	1 + 0	S2	8
Project to illustrate the ability to integrate relevant theory in the planning and presentation of an interior merchandise project for specific clients.					
Prerequisites: [SEM361] and [SEM362] and [Final-year status]					
ITW161	INTERIOR MERCHANDISE 161				
NAS_VBR	APP120	Afrikaans	2 + 1	K3	6
Study of different metals and finishes used for the manufacturing of objects.					
ITW162	INTERIOR MERCHANDISE 162				
NAS_VBR	APP120	Afrikaans	2 + 1	K4	6
Study of materials (non-metals) used for the manufacturing of objects, equipment and components of appliances used in the home.					
ITW251	INTERIOR MERCHANDISE 251				
NAS_VBR	APP210	Afrikaans	2 + 1	K1	6
Study and evaluation of non-electrical household equipment in terms of specific end-use situations.					
ITW261	INTERIOR MERCHANDISE 261				
NAS_VBR	APP120	Afrikaans	2 + 1	K3	6
Study and evaluation of major electrical household appliances for specific end-use situations and to facilitate consumer decision making.					
ITW262	INTERIOR MERCHANDISE 262				
NAS_VBR	APP120	Afrikaans	2 + 1	K4	6
Study and evaluation of portable electrical household appliances for specific end-use situations and to facilitate consumer decision making.					
ITW351	INTERIOR MERCHANDISE 351				
NAS_VBR	INT311	Afrikaans	2 + 1	K1	6
Choice of different materials and their application in specialised spaces such as residential spaces, hospitals, retail environments, office environments, etc. Prerequisite: [TKS251]					
ITW352	INTERIOR MERCHANDISE 352				
NAS_VBR	INT311	Afrikaans	2 + 1	K2	6
A study of applied finishes (floor and wall finishes etc.) used in interior spaces such as residential spaces, hospitals, retail environments, office environments.					
Prerequisites: [ITW351] and [TKS262 is recommended]					
ITW451	INTERIOR MERCHANDISE 451				
NAS_VBR	APP120	Afrikaans	2 + 1	K1	5
A study of the running and life cycle costs of household appliances. Sustainability aspects. Environmental concerns.					
KEP261	CULTURAL EATING PATTERNS 261				
NAS_VBR	VDG120	Afrikaans	3 + 0	K3	4
Origin and development of food habits; factors influencing habits and choice; dynamics. Influence of religion on food habits. Food habits of different ethnic groups.					
KEP262	CULTURAL EATING PATTERNS 262				
NAS_VBR	VDG120	Afrikaans	3 + 0	K4	4
Cuisine – the influence of culture on food habits, food choice and cuisine. Study of the cuisine of selected groups in South Africa. Study of the cuisine of selected African, European and Eastern countries.					
KGK255	DESIGN HISTORY 1750-1940 255				
GW_KGK	n a	Double	3 + 0	K1	10
Study of the appearance of styles in visual culture in relation to the changes in ideas and technology, 1750-1940. The origins and characteristics of industrial design. Influence of					

cultural codes and conventions on design styles. Description and contextualisation of design styles with reference to South Africa.					
KGK356	SOUTH AFRICAN ART: THEMES 356				
GW_KGK	na	Double	3 + 0	K3	15
This module focuses on various themes from South African art: traditional and contemporary. It gives a revisionist approach to the New Art History in South Africa, the Post-Colonial debate; the portrayal of man, the South African landscape tradition and African identity.					
KLD261	COSTUME AND FASHION HISTORY 261				
NAS_VBR	ONT311	Afrikaans	2 + 0	K3	3
Appearance characteristics of Western dress. Influencing factors. Evolution of styles from Ancient Egyptian up to and including the French Revolution.					
KLD262	COSTUME AND FASHION HISTORY 262				
NAS_VBR	ONT311	Afrikaans	2 + 0	K4	3
Appearance characteristics of Western dress. Influencing factors. Evolution of styles from the Directorate to the present. Prerequisite: [KLD261 GS]					
KLD352	SOCIAL-PSYCHOLOGICAL ASPECTS OF CLOTHING 352				
NAS_VBR	KLD220	Afrikaans	3 + 0	K2	4
Development of a framework; Symbolic-Interactionism as a framework; the cognitive approach.					
KLD353	CULTURAL ORIENTATION AND DRESS 353				
NAS_VBR	KLD310	Afrikaans	2 + 0	K1	3
Scope, culture creation and dress, dress and adaptation to society; functions of dress.					
KLD354	CULTURAL ORIENTATION AND DRESS 354				
NAS_VBR	KLD310	Afrikaans	2 + 0	K2	3
Reflection of human adaptation; culture creations (technical, moral and ceremonial patterns); societies and clothing; beauty standards and beauty ideals. Prerequisite: [KLD353 GS]					
KLD361	SOCIAL-PSYCHOLOGICAL ASPECTS OF CLOTHING 361				
NAS_VBR	KLD220	Afrikaans	3 + 0	K3	4
Development of the self: the body as indicator; personal values and norms. Prerequisite: [KLD352 GS]					
KLD362	SOCIAL-PSYCHOLOGICAL ASPECTS OF CLOTHING 362				
NAS_VBR	KLD220	Afrikaans	3 + 0	K4	4
Appearance management and presentation of the self: role acceptance, identity, social control, roles in social cognition. Prerequisite: [KLD361 GS]					
KLD363	CULTURE AND THE SOCIAL CONTEXT OF CLOTHES 363				
NAS_VBR	KLD310	Afrikaans	2 + 0	K3	3
Social context, identity, change and clothing: the family, politics, religion, economy and the role of clothing as a reflection of social and personal identities; mentefacts and identities; social change and clothing. Prerequisite: [KLD353 GS]					
KLD364	CLOTHING TEXTILE PRODUCT UTILISATION IN SOUTH AFRICA 364				
NAS_VBR	TKS320	Afrikaans	2 + 0	K3	3
A clothing consumer model; demographic and psychographic image; knowledge and information needs; rights and support; communication and sources of information. Prerequisite: [TKS262 GS]					
KLD365	CLOTHING CONSUMER BEHAVIOUR OF DIFFERENT GROUPS 365				
NAS_VBR	TKS320	Afrikaans	3 + 0	K4	4
The family and family life cycle and applicable groups; physical development; wardrobe planning. Prerequisite: [KLD364 GS]					

KLD451	THE SOUTH AFRICAN CLOTHING INDUSTRY 451				
NAS_VBR	KLD410	Afrikaans	3 + 0	K1	4
Basic principles of fashion; fashion production: Haute Couture and ready-to-wear. Prerequisites: [BEM251 GS] and [BEM252 GS] and [Fourth-year status]					
KLD452	CLOTHING MARKETING ASPECTS 452				
NAS_VBR	KLD410	Afrikaans	3 + 0	K2	4
Fashion as a product and the consumer; fashion-marketing communication. Prerequisite: [KLD451 GS]					
KLD453	RETAIL AND WHOLESALE IN THE CLOTHING INDUSTRY 453				
NAS_VBR	n a	Afrikaans	2 + 0	K1	3
Introduction: factors influencing stock movement; redistribution of stock; merchandising processes. Prerequisite: [Fourth-year status]					
KLD454	RETAIL AND WHOLESALE IN THE CLOTHING INDUSTRY 454				
NAS_VBR	n a	Afrikaans	2 + 0	K2	3
Planning stock movement; factors influencing buying strategies. Prerequisite: [Fourth-year status]					
KLD455	CLOTHING CONSUMER BEHAVIOUR 455				
NAS_VBR	n a	Afrikaans	1 + 1	K1	6
Application clothing, textile and consumer knowledge by utilising a CAD program for planning and assembling apparel. Prerequisite: [Fourth-year status]					
KLD456	THE SMALL BUSINESS ENTERPRISE 456				
NAS_VBR	KLD412	Afrikaans	3 + 0	K1	4
Introduction: clothing small business enterprises; types and locations. Prerequisite: [Fourth-year status]					
KLD457	THE SMALL BUSINESS ENTERPRISE 457				
NAS_VBR	KLD412	Afrikaans	3 + 0	K2	4
Marketing aspects: target market selection; product mix; pricing methods; distribution channels; marketing communication mix; financial aspects. Prerequisite: [KLD456]					
KLD461	VISUAL MERCHANDISING 461				
NAS_VBR	KLD410	Afrikaans	3 + 0	K3	4
Basic components; tools and techniques; planning. Prerequisite: [KLD452 GS]					
KLD462	GENERAL MANAGERIAL ASPECTS IN THE CLOTHING INDUSTRY 462				
NAS_VBR	KLD420	Afrikaans	3 + 0	K4	4
Planning, purchasing, control; search for suppliers; relationship with suppliers; management roles and responsibilities; technology; ethical and legal behaviour. Prerequisite: [KLD461 GS]					
KLD464	RETAIL AND WHOLESALE IN THE CLOTHING INDUSTRY 464				
NAS_VBR	n a	Afrikaans	2 + 0	K3	3
Ranges of clothing; textiles, footwear and accessories merchandise; merchandise characteristics; customer services; packing and packaging. Prerequisite: [Fourth-year status]					
KLD465	RETAIL AND WHOLESALE IN THE CLOTHING INDUSTRY 465				
NAS_VBR	n a	Afrikaans	2 + 0	K4	3
Global interdependence: appreciation of cultural differences; respect for diversity; trade agreements and implications; understanding import/export regulations. Prerequisite: [Fourth-year status]					

KLD466	THE SMALL BUSINESS ENTERPRISE 466				
NAS_VBR	KLD421	Afrikaans	2 + 1	K3	7
General management functions: purchase planning; job description and employment; administrative systems; legal and ethical behaviour. Prerequisite: [KLD457]					
KLD467	THE SMALL BUSINESS ENTERPRISE 467				
NAS_VBR	KLD421	Afrikaans	2 + 0	K4	3
Product presentation: fashion shows; planning; tools and techniques. Prerequisite: [KLD466]					
KLR151	CLOTHING PRODUCTION 151				
NAS_VBR	KLK120	Afrikaans	1 + 1	K1	6
A study of sewing appliances and equipment and the handling and use of different types of fabric.					
KLR152	CLOTHING PRODUCTION 152				
NAS_VBR	KLK120	Afrikaans	1 + 1	K2	6
Functional and creative sewing techniques; grading and quality assurance. Prerequisite: [KLR151]					
KLR161	CLOTHING PRODUCTION 161				
NAS_VBR	KLK120	Afrikaans	1 + 1	K3	6
Processes (collars, pockets, buttonholes, fasteners, belts, hems, etc.) Prerequisite: [KLR152]					
KLR162	CLOTHING PRODUCTION 162				
NAS_VBR	KLK120	Afrikaans	1 + 1	K4	6
Application: Unstructured, multi-sized garment or selected interior product. Prerequisite: [KLR161]					
KLR251	CLOTHING PRODUCTION 251				
NAS_VBR	KLK120	Afrikaans	1 + 1	K1	6
Pattern use and good fitting. Prerequisite: [KLR162]					
KLR252	CLOTHING PRODUCTION 252				
NAS_VBR	KLK120	Afrikaans	1 + 1	K2	6
The production of a customised garment. Prerequisite: [KLR251]					
KLR261	CLOTHING PRODUCTION 261				
NAS_VBR	KLK210	Afrikaans	0 + 2	K3	6
Tailoring. Prerequisite: [KLR252]					
KLR262	CLOTHING PRODUCTION 262				
NAS_VBR	KLK210	Afrikaans	1 + 2	K4	6
Small scale production: Industrial machines, production systems, quality assurance. Prerequisite: [KLR252]					
KLR352	CLOTHING PRODUCTION 352				
NAS_VBR	KLK220	Afrikaans	1 + 1	K2	6
Flat pattern design.					
KLR361	CLOTHING PRODUCTION 361				
NAS_VBR	KLK220	Afrikaans	1 + 1	K3	6
Draping design.					
KLR362	CLOTHING PRODUCTION 362				
NAS_VBR	KLK220	Afrikaans	1 + 1	K4	6
Application: the design and production of a customised outfit. Prerequisite: [KLR352]					

KLR452	CLOTHING PRODUCTION 452				
NAS_VBR	KLK310	Afrikaans	1 + 1	K2	6
Production design (flat pattern design plus CAD). Prerequisite: [KLR352]					
KLR461	CLOTHING PRODUCTION 461				
NAS_VBR	KLK310	Afrikaans	1 + 1	K3	6
Production: product analysis, planning and execution. Prerequisites: [KLR262] and [KLR352]					
KOB181	COMMUNICATION MANAGEMENT 181				
EB_BEM	n a	Bilingual	3 + 0	K3	5
Applied business communication skills: Acquiring basic business communication skills will enhance the capabilities of employees and managers in the business environment. This module provides an overview of skills on the intrapersonal, interpersonal, group (team), organizational, public and mass communication levels. The practical part of the module concentrates on the performance dimensions of these skills as applied to particular professions.					
KOB261	COMMUNICATION MANAGEMENT 261				
EB_BEM	n a	Bilingual	3 + 0	K3	8
Intercultural business communication: The management of communication within an international and intercultural context by being aware of the elements that may contribute to or become obstacles to effective communication. The analysis of cultural aspects which emphasise cultural differences like language, technology, social organization, contextualisation, power and leadership, nonverbal communication and the concept of time.					
KTP451	CLOTHING TEXTILE PROJECT 451				
NAS_VBR	n a	Afrikaans	2 + 0	S1	8
Project in field of application: planning.					
KTP461	CLOTHING TEXTILE PROJECT 461				
NAS_VBR	n a	Afrikaans	0 + 2	S2	16
Project in field of application: execution.					
KVK420	SMALL STOCK SCIENCE 420				
NAS_VKU	n a	Afrikaans	2 + 0.5	S2	12
Small stock management, shearing organisation, sheds and equipment, pens, dipping, drinking and feeding facilities. Preparation and marketing of hides, mohair and karakul. Lambing seasons and herd management. Management programmes for the production of wool, meat, karakul pelt and mohair according to the particular ecological region and for conditions of drought. Herd health programmes. Prerequisites: [LEK210] and [RPL320] and [VGE301] and [VKU220] and [VNE361]					
LBC320	INDUSTRIAL PRINCIPLES 320				
ING_LBI	LBC420	Afrikaans	2 + 0	S2	8
Laws. Mechanization, planning and management. Engineering models for agricultural production.					
LBP420	IRRIGATION 420				
ING_LBI	n a	Afrikaans	3 + 0.5	S2	15
Water and soil suitable for irrigation. Evaluation of irrigation systems and practices. Theory and design procedure for flood, sprinkler, drip and micro irrigation systems. Computer software for irrigation design. Prerequisite: [LHL311/LHL401]					
LBU260	AGROCLIMATOLOGY 260				
NAS_PGW	n a	English	3 + 1	S2	12
Climate in Southern Africa. Irradiation and energy balance. Hydrological cycle with special reference to downpour and evaporation from vegetative surfaces. Wind-breaks and frost					

control. Influence of climate on farming systems. Instrumentation and measurement of downpour, evaporation, radiation, temperature, humidity and wind.					
LBU481	APPLIED LAND-USE PLANNING 481				
NAS_PGW	n a	Bilingual	3 + 1	S1	14
Principles and techniques for collection and interpretation of physical, sociological and economic data required for the drafting of a land-use plan; principles of interaction with experts form different disciplines; drafting of an integrated land-use plan; consideration of alternatives; the system approach to land-use planning; planning with, and not for, people.					
LBU482	LAND-USE PLANNING PROJECT 482				
NAS_PGW	n a	Bilingual	0 + 3	S2	14
Practical drafting of a land-use plan for a selected field of study; defending of the proposed plan in an oral examination before a panel of examiners.					
LEK220	AGRICULTURAL MARKETING 220				
NAS_LEK	n a	Double	3 + 0	S2	12
The agribusiness system; the unique characteristics of agricultural products; marketing functions and costs; market structure; historical evolution of agricultural marketing in South Africa. Marketing environment and price analysis in agriculture: Introduction to supply and demand analysis. Marketing plan and strategies for agricultural commodities; market analysis; product management; distribution channels for agricultural commodities, the agricultural supply chain, the agricultural futures market.					
LEK251	INTRODUCTION TO FARM MANAGEMENT 251				
NAS_LEK	n a	Double	3 + 0	K1	6
Farm management and agricultural finance, farm management information; analysis of farming results; risk and farm planning; budgets: partial, break-even, enterprise, total, capital cash-flow budgets; obtaining agricultural finance and credit.					
LEK252	INTRODUCTION TO AGRICULTURAL PRODUCTION ECONOMICS 252				
NAS_LEK	n a	Double	3 + 0	K2	6
Introduction to production and resource use: the agricultural production function, total physical product curve, marginal physical product curve, average physical product curve, stages of production. Assessing short-term business costs. Economics of short-term decisions. Economics of input substitution: Least-cost use of inputs for a given output, short-term least-cost input use, effects of input price changes. Least-cost input use for a given budget. Economics of product substitution. Product combinations for maximum profit. Economics of crop and animal production.					
Prerequisite: [LEK251]					
LEK310	INTRODUCTION TO AGRICULTURAL POLICY ANALYSIS AND THEORY 310				
NAS_LEK	n a	English	3 + 0	S1	12
Historical evolution of South African agricultural policy. Agriculture and the state. Theoretical aspects of agricultural policy. Introduction to agricultural policy analysis. Welfare principles, pareto optimality. Macro-economic policy and the agricultural sector. International agricultural trade.					
Prerequisites: [LEK251 or EKN110] and [LEK252 or EKN120]					
LEK320	AGRIBUSINESS MANAGEMENT 320				
NAS_LEK	n a	Double	3 + 2	S2	18
Location and distribution; financing the agribusiness – capital acquisition, payback, capital sources; credit management; the market for agro-food products; cost structures; financial feasibility – capital budget, return on investment; legal forms of ownership. Management, management tasks and processes; fields of agribusiness management; business objectives; productivity; business organization; marketing; management information; IT in agribusiness; risk and insurance; strategic management. Seminar / assignment.					

LEK421	PRODUCTION ANALYSIS 421				
NAS_LEK	n a	English	3 + 2	S2	24
Price and production function analysis; input-output, input-input and product-product relationships; profit maximization; the production process through time, economies of size; risk and risk management; linear programming.					
Prerequisites: [LEK451] and [STK210]					
LEK424	RESOURCE ECONOMICS 424				
NAS_LEK	n a	English	3 + 0	K4	10
Definition and status of natural resources in Southern Africa; land, water, forests, minerals and environment. Introduction to resources and location. Optimal management of natural resources. Resource valuation. Cost-benefit analysis. Environmental policy.					
Prerequisites: [LEK251] and [LEK252]					
LEK451	AGRICULTURAL DEMAND AND SUPPLY ANALYSIS 451				
NAS_LEK	n a	English	3 + 2	K1	12
This module will focus on the demand and supply shifters as well as the elasticities, flexibilities, and impact multipliers. After providing an appropriate background in the theoretical concepts of demand and supply these basics will be applied in the generation of econometric/ simulation models. The student will submit a project in which he/she must analyse the demand or supply patterns of a commodity of his/her choice by generating an econometric model.					
Prerequisites: [LEK252] and [LEK261] and [LEK262] and [STK281]					
LEK452	COMMODITY PRICE ANALYSIS. 452				
NAS_LEK	n a	English	3 + 2	K2	12
This module will focus primarily on projecting and forecasting of prices spanning over long- as well as short-term time periods. A brief look at price determination under different market structures will be followed by practical sessions on measuring market structures in various ways. Some time will also be spent on measuring price changes by using indexes, and especially seasonal indexing. The relevance of changes to the main macro economic indicators will be discussed through out this course.					
Prerequisites: [LEK252] and [LEK261] and [LEK262] and [STK281]					
LEK463	AGRICULTURAL FINANCIAL MANAGEMENT AND MARKETS 463				
NAS_LEK	n a	English	3 + 0	K3	10
Information economics and concepts underlying the functioning of financial markets, financial analysis of agribusinesses, capital theory and investment analysis, asset valuation, risk theory and portfolio analysis, risk management and pricing, lender-borrower relationships, structural issues in agriculture and policy issues in agricultural and rural financial markets. Prerequisites: [LEK251] and [LEK252]					
LEK485	PROJECT PLANNING AND APPRAISAL 485				
NAS_LEK	n a	Bilingual	3 + 0	S1	20
The project concept. Project cycle: identification, preparation and appraisal, implementation, evaluation. Development programming. Decision making in public projects. Policy vs project analysis. Cost-benefit analysis.					
LGD411	SOIL DYNAMICS 411				
ING_LBI	LGD410/413	Afrikaans	2 + 0.5	S1	10
Dynamic soil properties and its measuring, soil dynamics as applicable to soil cultivation, traction and soil compaction.					
LGH420	SOIL CONSERVATION AND HYDROLOGY 420				
ING_LBI	n a	Afrikaans	3 + 0.5	S2	15
Soil conservation: Erosion and control measures to prevent it. Run-off control planning. Construction of earth dams. Planning and design of contour systems. Dam capacities for small catchment areas.					

LHL311	HYDRAULICS 311				
ING_LBI	n a	Afrikaans	2 + 0.5	S2	10
Hydrostatics, hydrodynamics, pipe flow, channel flow, hydraulic structures.					
LHL411	HYDRAULICS 411				
ING_LBI	LHL411	Afrikaans	2 + 0.5	S1	15
Turbines, centrifugal and other pumps for agricultural use. Design of drainage schemes and canal systems.					
LIR410	AGRICULTURAL ENGINEERING 410				
ING_ING	n a	English	2 + 2	S1	8
Surveying, water sources, hydrology, determination of runoff, channel flow, storm water drainage, terracing, rainfall erosion losses, sediment yield in runoff, buttress and arch dams, circular storage dams.					
LIR421	AGRICULTURAL ENGINEERING 421				
ING_ING	n a	Afrikaans	3 + 2	S2	8
Soil conservation, mechanization management, farm machinery, hydraulics and pumps, applied electricity.					
LIR422	AGRICULTURAL ENGINEERING 422				
ING_ING	n a	English	3 + 1	S2	8
Farm power, agricultural production machinery, mechanization management, tractor and implement costing, hitch systems.					
LKM262	AGRICULTURAL CLIMATOLOGY 262				
NAS_PGW	n a	Bilingual	2 + 0.5	K4	6
<i>Capita selecta</i> from Agroclimatology (LBU260).					
LKM451	ENVIRONMENTAL BIOPHYSICS 451				
NAS_PGW	LKM312	Bilingual	2 + 1	K1	9
Environmental variables. Quantitative description and measurement of atmospheric environmental variables and water in organisms. Prerequisite: [WTW134]					
LKM452	ENVIRONMENTAL BIOPHYSICS 452				
NAS_PGW	LKM312	Bilingual	2 + 0	K2	7
Mass and energy fluxes. Quantitative description of energy fluxes in organisms' environments. Energy balances of animals and plant communities will be derived. Prerequisite: [LKM451]					
LKW222	AGRICULTURAL POWER UNITS 222				
ING_LBI	n a	Afrikaans	2 + 0.5	S2	14
Components and working principles of internal combustion engines. Gearboxes, differentials and final drives. Brake and steering systems. Hydraulic systems. Electricity on the farm.					
LLI420	RURAL ENGINEERING 420				
ING_LBI	n a	Afrikaans	3 + 0	S2	9
Planning, utilization and management of natural resources in rural areas on a sustainable basis, planning and management of different irrigation systems, surface and subsurface drainage, soil and water conservation, structures, waste control and environmental planning.					
LLS410	AGRICULTURAL STRUCTURES 410				
ING_LBI	n a	Afrikaans	3 + 0.5	S1	15
Building construction. Functional requirements for and design of farm-related structures; housing systems and handling facilities for different species of animals.					

LOX320	DESIGN 320				
ING_LBI	LSC320	Afrikaans	0 + 1	S2	8
Identification of a suitable subject for Project 402. Detailed literature study with accompanying report. Planning of project execution. Workshop practice.					
LPR311	PROCESSING 311				
ING_LBI	N a	Bilingual	3 + 0	S1	8
Food processing engineering. Mass and energy balance. Handling of fluids: theory and equipment. Centrifugation and filtration. Storage and handling of solids. Basic instrumentation. Construction materials and their care. Cleaning-In-Position. Practical work: Viewing and demonstration of appropriate equipment, factory visits.					
LPR312	PROCESSING 312				
ING_LBI	N a	Bilingual	2 + 0.5	S1	8
Food processing equipment, heat transfer: convection, conduction and radiation. Heat exchanges. Pasteurisation, sterilisation and evaporation. Ovens and blast furnaces. Generation and distribution of steam. Mass transfer: distillation, extraction, ion exchange, membrane techniques, drying. Instrumentation and drawings. Practical work: Viewing and demonstration of appropriate equipment, factory visits.					
LPW410	AGRICULTURAL PRODUCTION EQUIPMENT 410				
ING_LBI	LPW413	Afrikaans	2 + 0.5	S1	10
Aims of cultivation. Working principles and construction of different agricultural implements.					
LSC402	PROJECT 402				
ING_LBI	N a	Afrikaans	0 + 1.5	J1	32
Execution of the research project in chosen subject. Detailed project report. Oral presentation to SAIAE members. Prerequisite: [LOX320]					
LSQ313	COMMUNICATION 313				
ING_LBI	N a	Afrikaans	0.5 + 0	S1	2
Principles and forms of verbal and written communication. Delivering speeches on various subjects. Procedures at meetings.					
MBY161	INTRODUCTION TO MICROBIOLOGY 161				
NAS_MBY	N a	Bilingual	4 + 1	K3	8
General anatomy and morphology of bacteria, viruses and fungi. Basic nutritional requirements of micro-organisms and the effect of environmental factors on microbial growth. Micro-organisms as essential components of ecospheres: plant, water and soil ecosystems. Food decay, food poisoning and preservation of food by micro-organisms. Basic principles involved in disinfection, sterilization and control of microbes; techniques for microbial repression: sterilization by using heat, radiation, filtration, chemical; decimation of numbers. Prerequisites: [CMY117] and [MLB111]					
MBY251	GROWTH, DIVERSITY AND CONTROL OF BACTERIA 251				
NAS_MBY	n a	Bilingual	4 + 2	K2	12
Envelope of gram positive and gram negative rods. Growth of bacteria, replication of the genome, regulation of septum formation, diversity of cell division mechanisms across the prokaryotes, bacterial survival structures. Control of bacterial growth; classes of antibacterial agents, cellular targets for growth inhibition and killing of cells. Energy sources, harvesting from light versus oxidation, regulation of catabolic pathways, chemotaxis. Nitrogen metabolism, iron-scavenging. Alternative electron acceptors: denitrification, sulphate reduction, methanogenesis. Structure and function versus phylogenetics. Biodiversity; bacteria occurring in soil, water and air, associated with humans, animals, plants, and those of importance in foods and in the water. Prerequisite: [MBY161_GS]					

MBY261	GROWTH, ACTIVITY AND CONTROL OF FUNGI 261				
NAS_MBY	n a	Bilingual	4 + 2	K4	12
<p>Organisation and molecular architecture of fungal thalli, chemistry of the fungal cell. Mechanisms, quantification, regulation of and chemical and physiological requirements for growth, nutrient acquisition, primary metabolism; secondary metabolism; regulation of metabolism; mating and meiosis; spore development; spore dormancy, dispersal and germination. Classes of antifungal agents, cellular targets for inhibition and killing of cells. Fungi as saprobes in soil, air, plant, aquatic and marine ecosystems; role of fungi as decomposers and in the deterioration of materials; fungi as predators and parasites; mycoses, mycetisms and mycotoxicoses; fungi as symbionts of plants, insects and animals. Applications of fungi in biotechnology.</p> <p>Prerequisite: [MBY161]</p>					
MBY351	STRUCTURE AND DIVERSITY OF VIRUSES 351				
NAS_MBY	n a	Bilingual	4 + 2	K1	18
<p>Introduction to the viruses as a unique kingdom inclusive of their different hosts, especially bacteria, animals and plants; RNA and DNA viruses; viroids, tumour viruses and oncogenes, mechanisms of replication, transcription and protein synthesis; effect on hosts; viral immunology; evolution of viruses.</p> <p>Prerequisites: [BCM251] and [CMY127] and [MBY161]</p>					
MBY352	ENVIRONMENTAL MICROBIOLOGY 352				
NAS_MBY	n a	Bilingual	4 + 2	K1	18
<p>Basic concepts in microbial ecology; microbial evolution, microbial interactions, ecosystems and communities, gene transfer, abiotic factors, extreme environments. The role of micro-organisms in biogeochemical cycling, microbial food webs. International convention of biodiversity; potential exploitation of extreme environments, organisation of native populations in extreme environments, ecological aspects of deterioration control, soil, waste and water management, microbes in mineral and energy recovery, biodegradation and bioremediation. Ecological control of pests and disease.</p> <p>Prerequisite: [MBY161]</p>					
MBY353	GENETIC MANIPULATION OF MICROBES 353				
NAS_MBY	n a	Bilingual	4 + 2	K2	18
<p>Isolation of clonable DNA (genomic libraries, cDNA synthesis), cloning vectors (plasmids, bacteriophages, cosmids), plasmid incompatibility and control of copy number. Ligation of DNA fragments, modification of DNA ends and different ligation strategies. Direct and indirect methods for the identification of recombinant organisms. Characterization (polymerase chain reaction, nucleic acid sequencing) and mutagenesis of cloned DNA fragments. Gene expression in Gram-negative (<i>E. coli</i>), Gram-positive (<i>B. subtilis</i>) and yeast cells (<i>S. cerevisiae</i>). Use of <i>Agrobacterium</i> and baculoviruses for gene expression in plants and insect cells respectively. Applications in protein engineering, diagnostics and synthesis of useful products.</p> <p>Prerequisites: [BCM251] and [CMY127] and [MBY161]</p>					
MBY361	INDUSTRIAL MICROBIOLOGY 361				
NAS_MBY	n a	Bilingual	4 + 2	K3	18
<p>Underlying principles: the catalyst of the reaction is a self-replicating cell, energy transfer, mass transfer, growth mode, reactor design and operation, growth kinetics. Product development: economics of biotechnology, market needs, scope and market analysis, production and marketing, intellectual property rights, bioprospecting, microbial diversity, classical isolation and screening. Strain improvement: Metabolic flux and metabolosome analysis, metabolic and pathway engineering, protein engineering; directed mutagenesis and gene shuffling. Production of amino acids, antibiotics, enzymes, microbial polymers, alcohols and organic acids. Prerequisites: [BCM251] and [MBY251]</p>					

MBY362	FOOD MICROBIOLOGY 362				
NAS_MBY	n a	Bilingual	4 + 2	K4	18
Microbial quality and spoilage of food: meat , poultry, seafood; dairy products; fruits, vegetables and grains. Microbial food safety: food-borne pathogens; bacteria, viruses, parasites; toxins, mycotoxins; protective measures; preservation; HACCP. Food fermentations: Principles and organisms involved; examples: dairy, vegetables, traditional products, beer and wine. Microbial food analysis: Conventional approaches, rapid methods.					
Prerequisite: [MBY251]					
MBY363	MOLECULAR BIOLOGY OF PROKARYOTES 363				
NAS_MBY	n a	Bilingual	4 + 2	K4	18
Modification of genetic material: DNA damage and damage repair, photoreactivation, SOS response. Mobile elements, insertion sequences, transposons. Control of operons and regulons, negative control, positive control, mixed control, regulation by upstream DNA structure, sigma factors, the role of recombination in expression, regulation of translation, DNA-protein interactions. Posttranslational control: allosteric control, covalent modifications, compartmentalisation. Global regulatory networks, carbon catabolyte repression, alarmones, signal transduction, chemotaxis, regulation of fermentation and respiration, stress responses, adaptation to extreme environments. Folding of proteins, protein export, repair of damaged proteins.					
Prerequisites: [BCM251] and [CMY127] and [MBY161]					
MBY364	VERTEBRATE-MICROBE INTERACTIONS 364				
NAS_MBY	n a	Bilingual	4 + 2	K3	18
Normal interactions between humans or animals and microorganisms; Host-pathogen interactions; Principles of pathogenesis; Important infectious diseases of man and animals; Principles of diagnostics; Introduction to epidemiology.					
MIT113	ENGINEERING DRAWING 113				
ING_ING	n a	Bilingual	3 + 0	S1	16
Free-hand sketch work, covering: perspective, isometric and orthographic drawings. Drawing conventions, graphic techniques and assembly drawings. Evaluation of drawings and error detection. True lengths, planes, projections and intersection curves. Practical applications of these techniques. Schematic representation in chemical, electrical, electronic, mechanical and civil engineering systems. Introduction to computer-aided drawing of components including: crosshatching, dimensioning and detailing.					
MLB111	MOLECULAR CELL BIOLOGY 111				
NAS_GTS	MLB111	Double	4 + 1	S1	16
Introductory study of the ultrastructure, function and composition of representative cells and cell components. General principles of cell metabolism, molecular genetics, cell growth, cell division and differentiation.					
MTT251	FURNITURE AND TEXTILE HISTORY 251				
NAS_VBR	INT212	Afrikaans	3 + 0	K1	4
Influences of ideologies, social institutions and technology on the development of Western and other material cultures, especially on furniture and textiles. Style periods from Egyptian to the Romanesque period.					
MTT252	FURNITURE AND TEXTILE HISTORY 252				
NAS_VBR	INT212	Afrikaans	3 + 0	K2	4
Influences of ideologies, social institutions and technology on the development of Western and other material cultures, especially on furniture and textiles. Style periods from the Renaissance to the French Revolution.					
Prerequisite: [MTT251 GS]					

MTT261	FURNITURE AND TEXTILE HISTORY 261				
NAS_VBR	INT222	Afrikaans	3 + 0	K3	4
Influences of ideologies, social institutions and technology on the development of Western and other material cultures, on furniture and textiles. Style periods during the 19th and early 20th century (until World War I). Prerequisite: [MTT252 GS]					
MTT262	FURNITURE AND TEXTILE HISTORY 262				
NAS_VBR	INT222	Afrikaans	3 + 0	K4	4
Influences of ideologies, social institutions and technology on the development of Western and other material cultures, especially regarding furniture and textiles. Style periods from post-World War I until the present, including different South African cultural groups. Prerequisite: [MTT261 GS]					
OBG151	DESIGN PRINCIPLES 151				
NAS_VBR	OBG110	Afrikaans	2 + 1	K1	6
Introduction to basic concepts in design (design elements and principles).					
OBG152	DESIGN PRINCIPLES 152				
NAS_VBR	OBG110	Afrikaans	2 + 1	K2	6
Practical application of design principles in interior planning and design, foods, clothing. Colour theories. Prerequisite: [OBG151 GS]					
OBS110	BUSINESS MANAGEMENT 110				
EB_OBS	n a	Bilingual	3 + 0	S1	10
Introduction to Business Management as a science, the environment in which the enterprise operates, the field of business, the mission and goals of an enterprise, management and entrepreneurship. The choice of a form of enterprise, the choice of products and/or services, profit and cost planning for different sizes of operating units, the choice of location, the nature of production processes and the layout of the plant or operating unit.					
OBS120	BUSINESS MANAGEMENT 120				
EB_OBS	n a	Bilingual	3 + 0	S2	10
Introduction to and overview of general management, especially regarding the five management tasks, strategic management, contemporary developments and management issues, financial management, marketing, public relations. Note: For marketing students, marketing is replaced by financial management, and public relations by small business management. Introduction to and overview of the value chain model, management of the inputs, management of the purchasing function, management of the transformation process with specific reference to production and operations management, human resources management, and information management. Note: For information management students, information management is replaced by small business management.					
OBS181	BUSINESS MANAGEMENT 181				
EB_OBS	n a	Bilingual	2 + 0	S1	5
Business management as field of study, the functional and systems approaches; entrepreneurship and the establishment of enterprises; the external environments and stakeholders of a business; field of business, mission, objectives and strategic aspects; the choice of a product/service and determination of the market feasibility, forms of business and location factors.					
OBS182	BUSINESS MANAGEMENT 182				
EB_OBS	n a	Bilingual	2 + 0	S2	5
General management and leadership, management of human resources, information management, processes of value creation; purchasing and operations management; financial management, financial statements, investment decisions; cost and breakeven determination; marketing and public relations management.					

OBS251	BUSINESS MANAGEMENT 251				
EB_OBS	n a	Bilingual	3 + 0	K1	8
The role of logistics in an enterprise, definition and scope of customer service, electronic and other logistics information systems, inventory management, materials management with special reference to Japanese systems, management of the supply chain.					
OBS252	BUSINESS MANAGEMENT 252				
EB_OBS	n a	Bilingual	3 + 0	K2	8
Methods of transport and transport costs, types and costs of warehousing, electronic aids in materials handling, cost and price determination of purchases, organising for logistics management, methods for improving logistics performance.					
OBS351	BUSINESS MANAGEMENT 351				
EB_OBS	n a	Bilingual	4 + 0	K1	10
The environment in which human resource management takes place, job analysis, strategic human resource planning, equal employment opportunities, planning and management of training, development and careers, functioning in a global environment.					
OBS352	BUSINESS MANAGEMENT 352				
EB_OBS	n a	Bilingual	4 + 0	K2	10
The nature of negotiation preparation for negotiation, negotiating for purposes of climate, creation, persuasive communication, handling conflict and aggression, specialised negotiation, and collective bargaining in the South African context.					
OBS355	ENTREPRENEURSHIP 355				
EB_OBS	n a	Bilingual	3 + 0	K1	10
Characteristics and description of entrepreneurship, the entrepreneurial process, identification of opportunities, new business opportunities, the entrepreneurial manager, the entrepreneurial team.					
OBS356	ENTREPRENEURSHIP 356				
EB_OBS	n a	Bilingual	3 + 0	K2	10
The small business enabling environment, management of growth of a small business; the compilation of a business plan.					
OBS365	ENTREPRENEURSHIP 365				
EB_OBS	n a	Bilingual	3 + 0	K3	10
Performance motivation: Development of positive motives, role models, determining of the level of achievement motivation, reinforcement of the need for performance motivation, strategies and action plans.					
OBS366	ENTREPRENEURSHIP 366				
EB_OBS	n a	Bilingual	3 + 0	K4	10
Creativity, innovation, need for achievement, entrepreneurial role models, and the development of risk propensity.					
OKW451	WEEDS IN AGRICULTURE 451				
NAS_PGW	OKW413	Bilingual	3 + 1	K1	7
Identification of important weeds of crops, gardens and recreational areas. Identification of alien invasive and indigenous encroaching species. Impacts of weeds on desirable vegetation. Interference between crop and weed species through allelopathy and competition phenomena. Role of weeds in plant-biodiversity and crop production potential. Prerequisite: [PPK251]					
OKW452	WEED MANAGEMENT 452				
NAS_PGW	OKW413	Bilingual	3 + 1	K2	7
Weeds of agronomic and horticultural crops. Weed biology and ecology. Mechanical, cultural, biological and chemical weed management practices. Integrated weed management. Herbicide formulations and application techniques. Modes of action of					

herbicides, and their behaviour and fate in the environment.					
Prerequisite: [OKW451]					
OPI250	EXPERIENTIAL TRAINING IN INDUSTRY 250				
NAS_VBR	n a	Bilingual	1 + 0	S1	6
Compulsory practical training in the Food Industry during the second year, approved in consultation with the head of the department.					
OPI260	EXPERIENTIAL TRAINING IN INDUSTRY 260				
NAS_VBR	n a	Bilingual	1 + 0	S2	6
Compulsory practical training in the Food Industry during the second year, approved in consultation with the head of the department.					
OPI280	EXPERIENTIAL TRAINING IN INDUSTRY 280				
NAS_VBR	n a	Bilingual	1 + 0	K4	4
Compulsory practical training in the Hospitality Industry during the second year, approved in consultation with the head of the department.					
OPI380	EXPERIENTIAL TRAINING IN INDUSTRY 380				
NAS_VBR	n a	Bilingual	1 + 0	K1	4
Compulsory practical training in the Hospitality Industry during the third year, approved in consultation with the head of the department.					
OPI401	EXPERIENTIAL TRAINING IN INDUSTRY 401				
NAS_VBR	n a	Bilingual	1 + 0	K2	10
Compulsory practical training in the Food Industry during the course of two years, as determined by the head of the department.					
OPI402	EXPERIENTIAL TRAINING IN INDUSTRY 402				
NAS_VBR	n a	Bilingual	1 + 0	K1	2
Compulsory practical training in the Food Industry during the course of two years, as determined by the head of the department.					
OPI450	EXPERIENTIAL TRAINING IN INDUSTRY 450				
NAS_VBR	n a	Bilingual	1 + 0	S1	10
Compulsory practical training in the Food Industry during the fourth year, approved in consultation with the head of the department.					
OPI480	EXPERIENTIAL TRAINING IN INDUSTRY 480				
NAS_VBR	n a	Bilingual	1 + 0	S2	9
Compulsory practical training in the Hospitality Industry during the fourth year, approved in consultation with the head of the department.					
PGB401	PROJECT: HOSPITALITY MANAGEMENT 401				
NAS_VBR	n a	Afrikaans	4 + 0	J1	6
The theoretical and practical aspects of teaching Hotelkeeping and Catering will be covered. Industry exposure and practical involvement is an essential ingredient of this module.					
PGB402	PROJECT: HOSPITALITY MANAGEMENT 402				
NAS_VBR	n a	Afrikaans	4 + 0	J1	10
The theoretical and practical aspects of teaching Hotelkeeping and Catering will be covered. Industry exposure and practical involvement is an essential ingredient of this module.					
PGB451	HOSPITALITY MANAGEMENT PROJECT 451				
NAS_VBR	n a	Afrikaans	4 + 0	S1	12
Project in field of application.					
Prerequisite: [Final-year status]					
PGB461	HOSPITALITY MANAGEMENT PROJECT 461				
NAS_VBR	n a	Afrikaans	4 + 0	S2	12
Project in field of application.					
Prerequisite: [PGB451]					

PGW351	SOIL WATER RELATIONS 351				
NAS_PGW	PGW422	Bilingual	3 + 1	K1	8
Quantitative description and measurement of soil water content and potential as well as saturated and unsaturated hydraulic conductivity. Modelling water flow in soil (Darcy's law, Richards's equation). Infiltration, redistribution, evaporation, runoff and percolation. Prerequisite: [GKD250 one crop module to be taken before or together with PGW351]					
PGW352	IRRIGATION MANAGEMENT 352				
NAS_PGW	PGW422	Bilingual	3 + 1	K2	8
Irrigation in South Africa. Modelling and managing the soil water balance. Plant water consumption and the Soil-Plant-Atmosphere Continuum. Irrigation scheduling (soil, plant and atmosphere approaches). Managing poor quality water. Irrigation systems. Module includes a field trip to an irrigation scheme. Prerequisite: [PGW351]					
PGW361	EXPERIMENTAL DESIGN AND ANALYSIS 361				
NAS_PGW	PGW421	Bilingual	2 + 1	K3	8
Basic experimental designs. Measurement and control over experimental error. Factorial experiments and interactions. Analysis of variance (ANOVA) and data interpretation. Prerequisites: [BME161] and [BME162]					
PGW400	SCIENTIFIC COMMUNICATION 400				
NAS_PGW	PGW400	Bilingual	3 + 0	J1	20
Basic principles of the scientific process. Literature accessing and article assessment. Manuscript preparation and presentation of seminars. Basic instruction on the use of visual aids, etc. for effective oral presentations.					
PGW401	SCIENTIFIC COMMUNICATION 401				
NAS_PGW	PGW401	Bilingual	1 + 0	J1	20
Basic principles of the scientific process. Literature accessing and article assessment. Manuscript preparation and presentation of seminars. Basic instruction on the use of visual aids, etc. for effective oral presentations.					
PGW460	LAND-USE PLANNING 460				
NAS_PGW	PGW423	Bilingual	3 + 1	S2	14
Interpretation of resource data. Land suitability evaluation for different uses. Special management requirements for different situations. Consideration of alternatives. Quantitative and economic aspects of land-use planning. ALES. Aspects of conservation and environmental impact. Geographic Information Systems (GIS). Practical work: Use and handling of maps. Aerial photogrammetry. Reporting and maps. Field excursions. Prerequisite: [GKD250 any crop, pasture or horticultural course]					
PGW480	PROJECT IN LAND-USE PLANNING 480				
NAS_PGW	PGW480	Bilingual	3 + 1	S2	14
Practical composition of a land-use plan for a selected field of study; defending of proposed plan during an oral exam before a panel of examiners. Prerequisite: [GKD250]					
PHY101	GENERAL PHYSICS 101				
NAS_PHY	n a	English	4 + 1	J1	16
This is an extended version of PHY131. Units, vectors, one-dimensional kinematics, dynamics, work, equilibrium, sound, fluids, heat, electrical, potential and capacitance, dc and ac currents, optics, modern physics, radioactivity. We recommend that students with an inadequate knowledge of Mathematics and/or Physical Science register for computer-aided education at the Goldfields Computer Centre. Prerequisite: [Par 1.2]					
PHY102	MECHANICS and ELECTRICITY 102				
NAS_PHY	n a	Double	4 + 1	J1	16
This course follows after PHY101 and together they are equivalent to the PHY171 course. Kinematics of a point, relativistic kinematics, dynamics of particles, rotation and dynamics					

of rigid bodies, simple harmonic motion, electrostatics, electrodynamics, elementary alternating current.					
Prerequisite: [PHY101]					
PHY131	GENERAL PHYSICS 131				
NAS_PHY	n a	Double	4 + 1	S1	16
This course is equivalent to the first semester of PHY181 and is intended for students who require only a single semester of physics. We recommend that students with an inadequate knowledge of Mathematics and/or Physical Science register for computer-aided education at the Goldfields Computer Centre.					
Prerequisite: [Par 1.2]					
PHY161	ASTRONOMY 161				
NAS_PHY	n a	Bilingual	4 + 0	S2	16
This course is presented in English only. Concepts which were discussed qualitatively in SCI151 are now treated quantitatively using mathematics. SCI151 is not a prerequisite for this course, but is strongly recommended. Prospective students must have had exposure to at least one semester of university Mathematics and must have thoroughly mastered their school background in Physics. One semester of Physics at university level is strongly recommended. Spherical trigonometry, co-ordinate systems, luminosity, intensity and the inverse square law of radiation. Pogson's law. Keplerian orbits. Newton's laws. Synodic and sidereal periods. The Stefan-Boltzmann law. The size of stars. Binaries and the masses of stars. The temperature of planets. Doppler shifts. Solar and lunar eclipses. The saros and the regression of nodes.					
Prerequisite: [Par 1.2]					
PHY171	FIRST COURSE IN PHYSICS 171				
NAS_PHY	n a	Double	4 + 1	J1	32
Mathematical introduction, density, kinematics of a point, dynamics of a particle, rotation and dynamics of rigid bodies, collisions, pressure, equilibrium, gravitation, simple harmonic motion, waves, sound, heat, electrostatics, electrodynamics, direct current circuits and instruments, magnetism, inductance, elementary alternating current theory, mirrors and lenses. The PHY171 course is intended for students in the physical and mathematical sciences. We recommend that students with an inadequate knowledge of Mathematics and/or Physical Science register for computer-aided education at the Goldfields Computer Centre.					
Prerequisites: [WTW114 #] and [WTW126 #] and [WTW128 #] and [Par 1.2]					
PHY181	GENERAL PHYSICS 181				
NAS_PHY	n a	Double	4 + 1	J1	32
Sem. 1: Units, vectors, one-dimensional kinematics, dynamics, work, equilibrium, sound, fluids, heat, electrical potential and capacitance, dc and ac currents, optics, modern physics, radioactivity. Sem. 2: Two-dimensional kinematics, rotation, vibration and waves, heat, dc and ac circuits, magnetism, induction. This course is intended for students in the life sciences (biology, medicine etc.) We recommend that students with an inadequate knowledge of Mathematics and/or Physical Science register for computer-aided education at the Goldfields Computer Centre. Prerequisite: [Par 1.2]					
PHY251	GENERAL PHYSICS 251				
NAS_PHY	n a	Bilingual	4 + 2	K1	12
Heat and Thermodynamics: Equations of state, laws of thermodynamics, kinetic-molecular theory, Van der Waals gas, enthalpy, Carnot cycle, heat engines, entropy, thermodynamic potentials. Electrodynamics: Magnetism in matter, Maxwell's equations. Physical Optics: Electromagnetic waves, dispersion, interference, diffraction. Fluids: Archimedes' principle, Bernoulli's equation.					
Prerequisites: [PHY171 or PHY101,102] and [WTW211 #] and [WTW218 #]					

PHY252	MODERN PHYSICS 252				
NAS_PHY	n a	Bilingual	4 + 2	K2	12
Special Relativity: Einstein's postulates, coincidence of events, time dilation and length contraction, momentum and energy. Quantum Physics: Wave-particle duality, Heisenberg's uncertainty principle, the Bohr model, Schrödinger equation in one dimension with piece-wise constant potentials, quantisation of energy and angular momentum, hydrogen atom, spin and exclusion principle. Nuclear Physics: Nuclear forces, nuclear structure, radioactive decay. Particle Physics and Cosmology: Elementary particles, laws of conservation, expanding universe.					
Prerequisites: [PHY171 or PHY101,102] and [PHY251 #] and [WTW211 #] and [WTW218 #]					
PHY261	CLASSICAL MECHANICS 261				
NAS_PHY	n a	Bilingual	4 + 2	K3	12
Conservative forces, symmetrical motion, damping and periodic forces, laws of conservation, projectile motion, central force fields, planetary motion, rotating co-ordinate systems, free path length, scattering, many-body problems, rigid bodies, elastic and inelastic collisions.					
Prerequisites: [PHY251 GS] and [PHY252 GS] and [WTW211 GS] and [WTW218 GS] and [WTW220 #] and [WTW221 #]					
PHY262	PHYSICS OF MATERIALS AND RENEWABLE ENERGY 262				
NAS_PHY	n a	Bilingual	4 + 2	K4	12
Physics of materials: Diffusion, phase diagrams, vacuum processing, material properties, material characterization, thin film fabrication, novel materials, nanostructures. Renewable energy: Sources, solar radiation, equivalent black body, beam and diffusion radiation, spectrally selective surfaces, greenhouse effects, ideal concentrators, edge ray principle.					
Prerequisites: [PHY251 GS] and [PHY252 GS] and [PHY261 #] and [WTW211 GS] and [WTW218 GS] and [WTW220 #] and [WTW221 #]					
PHY351	QUANTUM MECHANICS AND MODELLING 351				
NAS_PHY	n a	Bilingual	4 + 2	K1	18
Quantum mechanics: Wave function, probability interpretation, expectation values, Schrödinger equation, postulates of quantum mechanics, matrix formalism, momentum representation, applications. Modelling: numerical solutions and simulations.					
Prerequisites: [PHY251 #] and [PHY252 #] and [PHY261 GS] and [PHY262 GS] and [WTW220 GS] and [WTW221 GS]					
PHY352	SOLID STATE PHYSICS AND OPTICS 352				
NAS_PHY	n a	Bilingual	4 + 2	K2	18
Solid State Physics: Crystallography, diffraction, lattice vibrations, free electrons in metal, band theory, superconductivity. Optics: Fourier optics.					
Prerequisites: [PHY251 #] and [PHY252 #] and [PHY261 GS] and [PHY262 GS] and [PHY351 #] and [WTW220 GS] and [WTW221 GS]					
PHY353	PHYSICS PROJECT 353				
NAS_PHY	n a	Bilingual	0 + 3	S1	12
A student is required to complete a project under guidance of the lecturer. The nature of the project is determined jointly by the student, lecturer and the head of department. Requirement: Admission only with the approval of the head of department and lecturer involved. PHY 353 cannot be used as substitute for other Physics 300 courses to obtain admission to the BSc(Hons) in Physics. Prerequisite: [TDH]					
PHY361	ELECTROMAGNETISM AND ELECTRONICS 361				
NAS_PHY	n a	Bilingual	4 + 2	K3	18
Electromagnetism: Coulomb's law, electric field, Gauss' law, capacitance, magnetism, magnetic induction, inductance, alternating currents, impedance, Maxwell's equations,					

transmission lines. Electronics: Properties of semiconductor materials, diodes, transistors, transistor amplifiers, operational amplifiers, logic circuitry.					
Prerequisites: [PHY251] and [PHY252]					
PHY362	STATISTICAL PHYSICS 362				
NAS_PHY	na	Bilingual	4 + 2	K4	18
Laws of Thermodynamics, thermodynamic potentials, classical and quantum statistics, ensemble theory, black body radiation, Bose-Einstein condensation, applications.					
Prerequisites: [PHY251] and [PHY252] and [PHY261 #] and [PHY262 #] and [PHY351 GS] and [PHY352 GS] and [PHY361 GS] and [WTW220 #] and [WTW221 #]					
PHY363	PHYSICS PROJECT 363				
NAS_PHY	na	Bilingual	0 + 3	S2	12
A student is required to complete a project under guidance of the lecturer. The nature of the project is determined jointly by the student, lecturer and the head of department. Requirement: Admission only with the approval of the head of department and lecturer. PHY 363 cannot be used as substitute for other Physics 300 courses to obtain admission to the BSc(Hons) in Physics. Prerequisite: [TDH]					
PLG251	INTRODUCTORY CROP PROTECTION 251				
NAS_MBY	PLG220	Bilingual	2 + 1	S1	12
Development and importance of crop protection. Basic principles in crop protection i.e. epidemic development of disease and insect pest populations, ecology of plant diseases and abiotic factors that affect plant health i.e. environmental pollution and pesticides, nutrient deficiencies and extreme environmental conditions. Ecological aspects of plant diseases, pest outbreaks and weed invasion. Important agricultural pests and weeds. Life cycles of typical disease causing fungi, bacteria, viruses, viroids, nematodes and protozoa. Basic principles of integrated pest management.					
PLG261	EPIDEMIOLOGY 261				
NAS_MBY	PLG412	Bilingual	2 + 1	S2	8
Interdisciplinary epidemiological principles. Concepts, definitions as well as mathematical models of epidemics. Classical epidemiological case studies selected from the fields of animal, human and plant diseases are discussed.					
PLG351	GENERAL PLANT PATHOLOGY 351				
NAS_MBY	PLG220	Bilingual	2 + 1	S1	18
Fundamental principles of plant diseases as well as socio-economic importance thereof. Different types of diseases and their symptomatology. Biology and life cycles of selected diseases caused by fungi, bacteria, viruses and nematodes. Plant disease diagnosis.					
PLG361	PLANT MICROBE INTERACTIONS 361				
NAS_MBY	PLG412	Bilingual	2 + 1	K3	9
Include fungal, bacterial and viral interactions. Focus on molecular and cellular events occurring during recognition, during fungal evasion of the host's defence mechanisms and during disease symptom development. Topics discussed will also include cell biology of interactions, systemic acquired resistance and the role of pathogenesis related proteins and toxins in pathogenesis.					
PLG362	POPULATION BIOLOGY 362				
NAS_MBY	PLG412	Bilingual	2 + 1	K3	9
Use of models in plant epidemiology, population genetics, structure and dynamics, dispersal movement and spatial processes. Soil microbial ecosystems.					
PLG363	PLANT DISEASE CONTROL 363				
NAS_MBY	PLG421	Bilingual	2 + 1	S2	18
Principles of plant disease control. Non-chemical control including biological control, disease resistance, regulatory measures, cultivation practices, physical methods. Modern					

chemotherapy: characteristics, mode of action and application of fungicides, bactericides and nematocides. Principles of integrated pest and disease management.					
PLG461	NURSERY AND SEED PATHOLOGY 461				
NAS_MBY	PLG422	Bilingual	1 + 0.5	S2	10
Principles of disease control in nurseries. Quality assessment of nurseries. Chemical and non-chemical control measures will be discussed including disinfection of soil and growth media. Plant improvement schemes, production of disease-free plant material and indexing of mother material for plant pathogens. Seed pathology: principles, detection and control of seed-borne diseases.					
PLG462	RESEARCH PROJECT 462				
NAS_MBY	MBY401	Bilingual	1 + 1	J1	20
A practical research project of limited extent under the supervision of one of the lecturers in Plant Pathology within the Department. Any topic in Plant Pathology can be selected.					
PPK251	SUSTAINABLE PRODUCTION SYSTEMS 251				
NAS_PGW	PPK210	Bilingual	3 + 1	K1	6
Sustainability in plant production. Principles and practices of monoculture, crop rotation, ley cropping and intercropping systems. Organic farming. Precision farming. Concepts such as target yield, maximum economic yield and the farming systems approach. Principles of soil cultivation and conservation.					
Prerequisite: [BOT161 or BLG150]					
PPR450	AGROFORESTRY 450				
NAS_PGW	PPR713	Bilingual	2 + 0.5	S1	12
Agro-ecological zones (climate and soil); trees for fruit, fodder, fuel and/or timber; intercropping or alley cropping with grains, vegetables or pasture; management (including aspects such as nursery production, establishment, fertilization, pest control) and utilization/marketing.					
PVK420	POULTRY SCIENCE 420				
NAS_VKU	n a	Afrikaans	2 + 0.5	S2	12
Applied breeding of poultry. Design and utilization of equipment and housing facilities; product quality and marketing of poultry products; hygiene and health programmes.					
Prerequisites: [LEK210] and [VGE301] and [VKU220]					
RHD262	PARTICIPATORY RAPID RURAL APPRAISAL FOR RURAL COMMUNITY DEVELOPMENT 262				
NAS_VBR	n a	Bilingual	2 + 1	K4	4
Introduction to PRA. PRA tools and techniques. Putting PRA into practice: designing and doing research, analysis of results, writing the research report; evaluation PRA training.					
RHD264	ANALYSIS OF RURAL HOUSEHOLDS AND THEIR ECONOMY 264				
NAS_VBR	n a	Bilingual	1 + 2	S2	10
Rural households as contributors to development. Household economy and development. Practical application through analysis of case studies/small RRA projects.					
RHD351	HOUSEHOLD DECISION MAKING AND MANAGEMENT 351				
NAS_VBR	n a	Bilingual	4 + 1	S1	18
Participation in decision making and problem solving. Management of household resources and situations. Practical application through case studies/small research project. requisite: [RHD264]					
RHD480	PARTICIPATION IN THE DEVELOPMENT OF RESOURCES 480				
NAS_VBR	n a	Bilingual	3 + 1	S1	20
Development of human resources. Planning and implementing programmes for development of human resources. Development of financial resources. Strategies for support of income generation by rural households. Prerequisite: [RHD351]					

RHD481	RURAL HOUSEHOLD DEVELOPMENT PROJECT 481				
NAS_VBR	n a	Bilingual	2 + 2	S2	20
Practical application of RHD480 in a project. Prerequisite: [RHD480]					
RPL310	REPRODUCTION SCIENCE 310				
NAS_VKU	n a	Bilingual	1 + 0.5	S1	8
Therionogenology, spermatogenesis, zoogenesis, the female sexual cycle. Species differences. Hormonal control of the sexual functions. Prerequisites: [DAF250] and [DAF260]					
RPL320	REPRODUCTION SCIENCE 320				
NAS_VKU	n a	Bilingual	2 + 0.5	S2	10
Artificial insemination. Semen collection techniques, the evaluation, dilution and conservation of semen. Collection, conservation and transfer of embryos. Collection of ova and in vitro fertilization. Handling of apparatus and practical insemination, oestrus observation and determination of gestation. Prerequisite: [RPL310]					
SCE170	RELIGIOUS TEACHING 170 170				
unk_unk	n a	Bilingual	1 + 0	J1	4
Prominent religions in South Africa, world views associated with these religions, the cultural role of religions, importance of holy days. Mysticism and the occult.					
SCI150	NATURAL SCIENCE 150				
NAS_CMY	n a	English	6 + 1	S1	12
Chemistry: measurement and calculations in chemistry, matter and energy, elements and atoms, ions and nomenclature, modern atomic theory, introduction to the periodic table, chemical bonding, chemical composition, introduction to chemical reactions, chemical reactions in aqueous solutions. (Note: one additional 1 hour tutorial session per week.) Physics: history of mechanics and electricity, use of mathematics in physics, kinematics of a particle with constant acceleration, the concept of a force, Newton's laws of motion. (Note: three lectures per week. One practical every alternative week.)					
SCI151	EXPLORING THE UNIVERSE 151				
NAS_PHY	n a	English	4 + 0	S1	16
This course is presented in English only. Students from all faculties are welcome to join us in our exploration of the universe from an earth-bound perspective. We reflect on the whole universe from the sub microscopic to the vast macroscopic and mankind's modest position therein. To what degree is our happiness determined by stars? Echoes from ancient firmaments - the astronomy of old civilisations. The universe is born with a bang. Stars, milky ways and planets are formed. Life is breathed into the landscape on earth, but is there life elsewhere? The architecture of the universe – distance measurements, structure of our solar system and systems of stars. How does it look like on neighbouring planets? Comets and meteorites. Life cycles of stars. Spectacular exploding stars. Exotic like pulsars and black holes. Prerequisite: [Par 1.2]					
SCI152	COMPUTER AND PROBLEM SOLVING SKILLS 152				
NAS_SCI	n a	English	0 + 1	S1	6
Computer literacy, using a word processor including mathematical formulas and graphics, Internet skills, logical reasoning skills, interpreting and solving mathematical problems with LOGO.					
SCI153	ACADEMIC PROFICIENCY 153				
NAS_SCI	n a	English	0 + 1	K1	3
Goals, time management, taking notes, mind maps, technique for writing exams, personal CV.					

SCI154	ACADEMIC PROFICIENCY 154				
NAS_SCI	n a	English	0 + 1	K1	3
Goals, time management, taking notes, mind maps, technique for writing exams, personal CV.					
SCI160	NATURAL SCIENCE 160				
NAS_CMY	n a	English	6 + 1	S2	12
Chemistry: types of chemical reactions, calculations based on chemical reaction equations, chemical solutions, chemical equilibrium, acids and bases, liquids, introduction to organic chemistry. (Note: one additional 1-hour tutorial session per week.) Physics: equilibrium of a particle and a fixed body, moment of a force, work, energy and power, momentum, theory of heat, electricity. (Note: three lectures per week. One practical every alternative week.)					
Prerequisite: [SCI150 GS]					
SCI162	PROBLEM SOLVING SKILLS 162				
NAS_SCI	n a	English	0 + 2	S2	6
System dynamics, computer modelling of elementary dynamic systems.					
Prerequisite: [SCI152]					
SCI163	BASIC RESEARCH SKILLS 163				
NAS_SCI	n a	English	0 + 1	K3	3
Scientific discoveries, the scientific method, scientific publications, ethics of science.					
SEM161	SCIENTIFIC WRITING SKILLS 161				
NAS_VBR	SEM181	Afrikaans	3 + 0	K3	4
Analytical approaches to the exploration of sources of scientific information to compile technically correct written scientific assignments.					
SEM361	RESEARCH METHODOLOGY 361				
NAS_VBR	n a	Afrikaans	3 + 0	K3	4
Research methodology – principles.					
Prerequisite: [SEM161]					
SEM362	RESEARCH METHODOLOGY 362				
NAS_VBR	n a	Afrikaans	3 + 0	K4	4
Application of principles for research methodology in the independent writing of a well structured literature study.					
Prerequisite: [SEM361]					
SLK151	PSYCHOLOGICAL PERSPECTIVES 151				
GW_SLK	n a	Bilingual	2 + 0	K1	6
This module is a general orientation to Psychology. An introduction is given to various theoretical approaches in Psychology, and the development of Psychology as a science is discussed. Selected themes from everyday life are explored and integrated with psychological principles. Compulsory introductory module.					
SLK152	COGNITIVE PROCESSES 152				
GW_SLK	n a	Bilingual	2 + 0	K2	6
In this module, various cognitive processes are studied, including perception, memory, thinking, intelligence and creativity. Illustrations are given of various thinking processes, such as problem solving, critical, analytic and integrative thinking. Compulsory introductory module.					
SLK154	HEALTH PSYCHOLOGY 154				
GW_SLK	n a	Bilingual	2 + 0	K3	6
This module is an introduction to psychological aspects related to illness and health. Themes such as the following are explored: the patient-helper relationship, stress and stress-related illnesses, lifestyle and illness/health, psychological aspects of physical					

illnesses, coping with emotional distress associated with illness, and psychological processes related to loss and death.					
SLK155	ENVIRONMENTAL PSYCHOLOGY 155				
GW_SLK	n a	Double	2 + 0	S2	6
This module deals with the reciprocal relationship between people and the natural and built environment. Environment-behaviour theories are explored and evaluated, as well as environmental stressors (e.g. noise), environmental disturbances (e.g. natural disasters and air pollution), and territoriality and personal space related to crowding and high density. The urban environment is discussed, with particular emphasis on its effects on the city dweller. Attention is given to the use of design principles to create more liveable spaces. Finally, strategies that encourage environmentally responsible behaviour are outlined.					
SLK156	DEVELOPMENTAL SYSTEMS THEORY 156				
GW_SLK	n a	Bilingual	2 + 0	K4	6
In this module, the entire lifespan development of the individual is investigated according to an ecosystemic model and a psychosocial approach. Explanations of the actions, roles and relationships of the person within various contexts of development. Understanding of and a sensitivity for the complexity of human development is acquired.					
SLK251	PERSONOLOGY 251				
GW_SLK	n a	Bilingual	2 + 0	K1	10
In the module on Personology, various theories of personality are studied, including the psychoanalytical and social learning theories, the person-oriented approaches, and the ecosystemic approach. An African perspective is also discussed. These approaches are compared and critically evaluated with regard to their basic assumptions, view of the person, and philosophy of science, as well as their contribution towards understanding and explaining human behaviour within contemporary contexts.					
Prerequisites: [SLK151] and [SLK152]					
SLK253	DEVELOPMENTAL PSYCHOLOGY 253				
GW_SLK	n a	Double	2 + 0	K2	10
In this module, the areas and determinants of early, middle and late adulthood development are studied. Incorporated are the developmental changes related to cognitive, physical, emotional and social functioning of the individual and the context of work. Traditional and contemporary theories of human development explaining and describing these stages are studied in order to address the key issues related to adulthood.					
SLK254	SOCIAL PSYCHOLOGY 254				
GW_SLK	n a	Bilingual	2 + 0	K3	10
This module is a social-psychological perspective on interpersonal and group processes. Themes that are covered include communication, pro-social behaviour, social influence and persuasion, political transformation, violence, and group behaviour.					
SLK255	PERSPECTIVES ON THE FAMILY 255				
GW_SLK	n a	Double	2 + 0	K3	10
In this module the student is introduced to the structural theories and the cybernetic approach with regard to family functioning and the family life cycle. These approaches are compared with regard to the individual in family context, family in cultural context, circular thinking and recursivity. The tension between traditional approaches and the systemic approach is discussed.					
SLK256	PSYCHOLOGICAL ASSESSMENT 256				
GW_SLK	n a	Bilingual	2 + 0	K4	10
This module deals with the nature and role of psychological measurement and assessment. It includes an overview of different perspectives on psychological					

assessment, the classification, nature and scope of various categories of tests and techniques, the role of ethics in psychometry, and the areas of application of psychological assessment and evaluation.					
SLK257	CHILDPSYCHOPATHOLOGY 257				
GW_SLK	n a	Bilingual	2 + 2	K2	10
Identification of abnormal behaviour in children based on knowledge of normal childhood development; introduction to the study of various models pertaining to abnormal behaviour; understanding and application of basic concepts in child psychopathology. Prerequisites: [OPV251] and [SLK251]					
SLK351	COMMUNITY PSYCHOLOGY 351				
GW_SLK	n a	Bilingual	2 + 0	K1	15
This module deals with a community psychological perspective on human behaviour and psychological interventions. The module focuses on themes such as definitions of key concepts, principles and aims of community psychology, and the role of the community psychologist. The application of these principles within the South African society, social change and psychological problems are investigated from a cross-cultural perspective.					
SLK352	ABNORMAL BEHAVIOUR 352				
GW_SLK	n a	Bilingual	2 + 0	K2	15
This module provides an introduction to psychopathology and symptomatology of adult abnormal behaviour. Terminology, definitions of abnormal behaviour, problems in diagnosis, labelling, and myths regarding abnormal behaviour are discussed. Neurosis as a specific mental disorder is studied critically from a multi-dimensional perspective, including intrapsychic, interpersonal and social-cultural explanations. Requires SLK 251 and SLK 253 Prerequisites: [SLK251] and [SLK253]					
SLK353	CRITICAL PERSPECTIVES 353				
GW_SLK	n a	Bilingual	2 + 0	K4	15
This is a module that critically explores the contribution of various perspectives in Psychology. The impact of earlier thought frameworks on contemporary perspectives, and the implications of these ideas for practical initiatives focused on mental health in communities, are discussed. Prerequisite: [SLK251]					
SLK354	COMMUNITY PSYCHOLOGY IN PRACTICE 354				
GW_SLK	n a	Double	0 + 2	S2	15
Practical module: Training to apply principles of community psychology to various fields of study. As a practical module it involves workshops, action research, and facilitation, empowerment, and evaluation of students while doing practical work within different communities. Prerequisites: [OPV251] and [SLK251] and [SLK253]					
SLK355	PSYCHOLOGICAL ASSISTANCE 355				
GW_SLK	n a	Bilingual	2 + 0	K3	15
This is a practical module which offers opportunities for practising basic communication and interpersonal skills, reflection and the utilisation of available resources during psychological assistance. Prerequisites: [SLK251] and [SLK352] and [Closed: needs departmental permission]					
SOC151	SOCIAL ORGANISATION AND INDIVIDUAL 151				
GW_SOC	n a	Double	2 + 1	K1	6
An introduction to Sociology, with reference to interaction between individuals, formation of groups, composition of society, culture and change, social networks, socialisation, crime and media.					

SOC152	SOCIAL INSTITUTIONS 152				
GW_SOC	n a	Double	2 + 1	K2	6
A focus on the social dynamics of the institutions of society, i.e. family, organisations, the economy, religion, education, government and power structures.					
SOC252	DOMESTIC LIFE 252				
GW_SOC	n a	Double	2 + 1	K2	10
Students are exposed to various theoretical approaches to the study of families, households and domestic relationships. The focus is on social dynamics of families and households, the dynamics of changes on a domestic level, and new types of households.					
STK110	STATISTICS 110				
NAS_WST	n a	Double	3 + 1	S1	13
Descriptive Statistics. Sampling and the collection of data, frequency distributions and graphical representations. Descriptive measures of location and dispersion. Probability and inference: Introductory probability theory and theoretical distributions. Sampling distributions. Estimation theory and hypothesis testing of sampling averages and proportions (one- and two-sample cases). Identification, use, evaluation and interpretation of statistical computer packages and statistical techniques.					
STK120	STATISTICS 120				
NAS_WST	n a	Double	3 + 1	S2	13
Multivariate statistics: Analysis of variance, categorical data analysis, distribution-free methods, curve fitting, regression and correlation, the analysis of time series and indices. Statistical and economical applications of quantitative techniques: Systems of linear equations. Drafting, matrices, solving and application. Optimization: Linear functions (two and more independent variables), non-linear functions (one and two independent variables). Marginal and total functions. Stochastic and deterministic variables in statistical and economical context: producers' surplus, consumers' surplus, distribution functions, probability distributions and probability density functions. Identification, use, evaluation and interpretation of statistical computer packages and statistical techniques.					
STK210	STATISTICS 210				
NAS_WST	n a	Bilingual	3 + 1	S1	20
Probability theory. Univariate probability distributions, expected values and moments. Special probability distributions: Binomial, hypergeometric, poisson, exponential, gamma, beta and normal distribution. Probability distributions and moments in the bivariate case. The bivariate normal distribution. Identification, use, evaluation and interpretation of statistical computer packages and statistical techniques.					
STK281	STATISTICS 281				
NAS_WST	n a	Bilingual	3 + 1	K3	10
Applied regression analysis: Simple and multiple regression, nonlinear regression, correlation, the use of dummy variables, heteroscedasticity, serial correlation and lag structures. Applied time series analysis. Identification, use, evaluation and interpretation of statistical computer packages and statistical techniques.					
SUR220	SURVEYING 220				
NAS_GGY	n a	English	1 + 0	S2	16
Definition of Surveying. Adjustment and use of the following instruments: Level, compass and Theodolite. Site surveying, levelling and tacheometry. Co-ordinate systems, angles of direction, joins and polars. Point positioning. Trigonometric height determination. Prerequisite: [WTW114 GS]					
SWK122	MECHANICS 122				
ING_ING	n a	Bilingual	4 + 0	S2	16
Equivalent force systems, resultants. Newton's laws, units. Forces acting on particles. Rigid bodies: principle of transmissibility, resultant of parallel forces. Vector moments and					

<p>scalar moments. Relationship between scalar and vector moments. Couples. Equivalent force systems on rigid bodies. Equilibrium in two and three dimensions. Hooke's law. Trusses and frameworks. Centroids and second moments of area. Hydrostatics: pressure at a point, resultant forces on submerged plane areas. Beams: distributed forces, shear force, bending moment, method of sections, relationship between load, shear force and bending moment.</p>					
TBE151	TOURISM MANAGEMENT 151				
EB_TBE	n a	Bilingual	4 + 0	K1	5
<p>Structure and organisation of the tourism industry. This introductory module provides an introduction to and overview of the tourism industry. Firstly definitions and concepts are explored, whereafter the evolution of tourism through the ages is addressed. With a sound frame of reference in place, the structure and organisation of tourism at the international, national, provincial and private sector levels, are examined.</p>					
TBE152	TOURISM MANAGEMENT 152				
EB_TBE	n a	Bilingual	4 + 0	K2	5
<p>The tourism system and the key components of tourism: This module provides various perspectives on the tourism system and then focuses on the specific components of the tourism system and their interdependence. Specific attention is placed on key components such as attractions, transportation, distribution channels, hospitality and related services.</p>					
TBE161	TOURISM MANAGEMENT 161				
EB_TBE	n a	Bilingual	4 + 0	K3	5
<p>Tourism demand, consumer behaviour and market research: As the consumer is central to success in the tourism industry, this module addresses tourism demand from both a quantitative and a qualitative perspective. An understanding is provided of tourist behaviour; cultural and international aspects of travel as well as the sociology of tourism. The latter part of this module focuses on the key role of travel and tourism research, particularly the application of research techniques and the interpretation of research results as an aid in tourism planning and decision-making.</p>					
TBE162	TOURISM MANAGEMENT 162				
EB_TBE	n a	Bilingual	4 + 0	K4	5
<p>Tourism supply, planning and development: This module focuses on supply side activities and services that need to be addressed to ensure quality visitor experiences. Particular attention is given to the formulation and implementation of sustainable tourism planning, development and management principles and practices.</p>					
TBE261	TOURISM MANAGEMENT 261				
EB_TBE	n a	Bilingual	4 + 0	K3	8
<p>The management of tourism attractions: In this module visitor attractions, which is at the core of successful tourism, will be addressed at three levels. Firstly, the key role of visitor attractions in the tourism industry will be outlined, whereafter the overall development process (feasibility studies, financial and design aspects, etc.) relating to visitor attractions will receive attention. The last part of this module focuses on the strategic management and operational aspects of visitor attractions.</p>					
TBE262	TOURISM MANAGEMENT 262				
EB_TBE	n a	Bilingual	4 + 0	K4	8
<p>Strategic destination marketing: This module firstly explores the unique characteristics of and approaches to strategic destination marketing, with particular emphasis on global best practices in this regard. It then provides a management and operational framework for destination marketing. Within this framework new developments, trends, practices and case studies in destination marketing are also addressed.</p>					

TBE361	TOURISM MANAGEMENT 361				
EB_TBE	n a	Bilingual	4 + 0	K3	10
Hospitality management: This module covers the “guest cycle” and addresses the process and procedures, from the moment a potential guest contacts an accommodation establishment to the time that he or she departs. All the operational and management functions of this process are covered in detail as well as key supportive aspects such as hospitality, social skills and customer care. A distinction is drawn between revenue centres and support centres. All the key support centres such as housekeeping, maintenance and security are covered. This module concludes with a well-rounded overview of the operational and management aspects of front office and its support units.					
TBE362	TOURISM MANAGEMENT 362				
EB_TBE	n a	Bilingual	4 + 0	K4	10
Hospitality management: This module firstly covers the key operational and management aspects of food and beverage management, which forms a vital part of hospitality management. Industry exposure and practical involvement is an essential ingredient of this module. As financial management and costing is critical to the success of any hospitality organisation, the second part of this module covers all the policies, principles and procedures pertaining to financial operations and financial management in such establishments.					
TKS251	BASIC TEXTILES: UTILITY ASPECTS 251				
NAS_VBR	TKS210	Afrikaans	3 + 1	K1	7
Basic components of textiles, consumer decision making, utility aspects that include durability, comfort, maintenance, health / safety / protection and aesthetic aspects.					
TKS252	BASIC TEXTILES: FIBRES AND YARNS 252				
NAS_VBR	TKS210	Afrikaans	3 + 1	K2	7
Fibre structure and performance including textile chemistry, fibre morphology and formation, fibre properties, classification and identification. Yarn structure and performance (including spun yarns, filament yarns, blended yarns, compound and novelty yarns).					
Prerequisite: [TKS251 GS]					
TKS261	BASIC TEXTILES: FABRIC STRUCTURES 261				
NAS_VBR	TKS220	Afrikaans	3 + 1	K3	7
Introduction to fabric structures. Woven fabrics, knits, non-woven fabrics and compound fabrics.					
Prerequisite: [TKS252 GS]					
TKS262	BASIC TEXTILES: FINISHES AND DYING PROCESSES 262				
NAS_VBR	TKS220	Afrikaans	3 + 1	K4	7
Introduction to fabric finishing. Preparatory and final finishes. Finishes for special end-uses: durability, comfort and protection; ease of maintenance; aesthetic appeal. Dyed and printed fabrics.					
Prerequisite: [TKS261 GS]					
TKS263	BASIC TEXTILES: PROJECT IN FIELD OF APPLICATION 263				
NAS_VBR	TKS220	Afrikaans	0 + 1	S2	6
Project to assess performance characteristics of textiles for specific end-use. A written report of the results is also required.					
Prerequisites: [TKS251 GS] and [TKS252 GS] and [TKS261 #] and [TKS262 #]					
TKS351	NEW USES OF TEXTILES 351				
NAS_VBR	INT314	Afrikaans	2 + 0	K1	3
Technical textiles (Interior design students).					
Prerequisites: [TKS251] and [TKS252] and [TKS261] and [TKS262] and [TKS263]					

TKS362	NEW USES OF TEXTILES 362				
NAS_VBR	n a	Afrikaans	2 + 0	K4	3
New developments (apparel and interior textiles). Prerequisites: [TKS251] and [TKS252] and [TKS261] and [TKS262] and [TKS263]					
TKS451	TEXTILES AND THE CONSUMER 451				
NAS_VBR	TKS320	Afrikaans	3 + 0	K1	4
Choices and purchasing: standards, quality recognition and sources of information. Prerequisites: [TKS251] and [TKS252] and [TKS261] and [TKS262] and [TKS263]					
TKS452	TEXTILES AND THE CONSUMER 452				
NAS_VBR	TKS320	Afrikaans	3 + 0	K2	4
Handling and care: General, consumer practices; sources of information. Prerequisite: [TKS451 GS]					
TLR320	ANIMAL BREEDING 320				
NAS_VKU	n a	Bilingual	2 + 0.5	S2	10
Introduction to applied breeding of animals; basis of heredity: cells, chromosomes and gametes, genes and mutations. Phenotypical showing of genes and different forms of interaction between genes. Gene frequencies. Comparison of qualitative and quantitative heredity. Population genetics: biometric concepts, population parameters and their calculation. Selection: efficiency, methods and aids. Breeding evaluation. Breeding systems. Prerequisite: [GTS226]					
TLR411	ANIMAL BREEDING 411				
NAS_VKU	n a	Afrikaans	2 + 0.5	S1	12
Advanced theory in (co)variance estimations of characteristics in farm animals. Heredity and genetic correlation and its use in breeding systems. Economically important characteristics. Index selection and estimation of indexes. Biometry of herd data: frequency distribution, normality, variances, scaling and transformations. Breeding values: estimation and use. Mating systems: inbreeding, hybridization and assortive/disassortive mating in cattle; circumstances in which it can be used. Selection for growth efficiency, reproduction etc. Breeding structures and group breeding schemes. Prerequisite: [TLR320]					
TLR420	ANIMAL BREEDING 420				
NAS_VKU	n a	Afrikaans	2 + 0.5	S2	12
Applied animal breeding. Performance testing of livestock, the associated legislation and administration. The analysis, interpretation and application of performance test data. Livestock breed societies and related industries. Prerequisite: [TLR411]					
TRN215	SITE SURVEYING 215				
NAS_GGY	n a	English	2 + 1	S1	8
Definition of surveying; maps, scales, map projection elements, the South African projection; measuring tape and engineer's level; plane surveying, distances, height determination by levelling, contours and interpolation; simple co-ordinate calculations, area and volume calculations; drawing of a simple site plan.					
TRN217	SITE SURVEYING 217				
NAS_GGY	n a	English	2 + 1	S1	8
Tacheometer, angle measurement and tacheometry; plot and drawing of detail site plans; construction surveys, areas and volumes, setting out of works. Tacheometric traverse.					
VBF451	CONSUMER FACILITATION 451				
NAS_VBR	VBG321	Afrikaans	3 + 0	K1	4
Consumer decision making through the family life cycle; determinants of consumer satisfaction. Consumer education; consumer competencies; less privileged consumers.					

VBF452	CONSUMER FACILITATION 452				
NAS_VBR	VBG321	Afrikaans	3 + 0	K2	4
A study of the needs and practices of the diverse SA consumer market. Consumerism. Globalism.					
Prerequisite: [VBF451]					
VBF462	CONSUMER FACILITATION 462				
NAS_VBR	VBG321	Afrikaans	3 + 0	K4	4
A study of the needs and practices of the diverse SA consumer market. Consumerism. Globalism.					
VBM400	COMMUNITY NUTRITION 400				
NAS_VBR	n a	Bilingual	2 + 1	J1	24
Basic principles of community nutrition. Nutritional assessment. Nutrition problems and programmes in Southern African communities.					
VDB361	FOOD SERVICE MANAGEMENT 361				
NAS_VBR	VDB320	Afrikaans	4 + 1	K3	10
Planning and layout of food service units for different food service systems. Choice and purchasing of equipment for different food service units. Hygiene and safety in food services.					
Prerequisite: [VDS361 #]					
VDB362	FOOD SERVICE MANAGEMENT 362				
NAS_VBR	VDB320	Afrikaans	4 + 1	K4	10
Principles of management as applied to food service systems. Human resource management in food service systems. Financial management in food services.					
Prerequisite: [VDB361]					
VDB451	FOOD SERVICE MANAGEMENT 451				
NAS_VBR	VDB410	Afrikaans	3 + 1	K1	8
The professional food service manager's roles, responsibilities and characteristics. Contemporary leadership and management styles in food service systems. Professionalism and ethics.					
Prerequisites: [VDB361] and [VDB362]					
VDB452	FOOD SERVICE MANAGEMENT 452				
NAS_VBR	VDB410	Afrikaans	3 + 1	K2	8
Advanced food service systems and production management techniques. Marketing of food services.					
Prerequisites: [VDB361] and [VDB362]					
VDB453	FOOD SERVICE MANAGEMENT 453				
NAS_VBR	VDB411	Afrikaans	2 + 0	S1	6
A study of the current trends in foods and food service management by reviewing and integration of the latest research findings and publications in these areas with previous course work.					
Prerequisites: [VDB451 #] and [VDB452 #]					
VDG163	PHYSIOLOGICAL FOUNDATIONS OF NUTRITION 163				
NAS_VBR	n a	Afrikaans	3 + 0	K4	4
Integration of natural science concepts basic to the study of human nutrition. Cell and tissue; digestive system, absorption and metabolism; energy metabolism and balance; body temperature; cardiovascular system; kidneys and acid-base equilibrium.					
VDG250	NUTRITION 250				
NAS_VBR	n a	English	3 + 0.5	S1	12
Nutrition in the context of growth, development and composition of organisms. Metabolic processes and control in the body. Overview of nutritional processes. The study of the					

fundamental principles of nutrient metabolism (including macro- and micro-nutrients and water). Applications are made regarding man and animals. Practical work: Experimental work and problem-orientated tasks.					
Prerequisite: [CMY127]					
VDG251	MACRO-NUTRIENTS AND ENERGY 251				
NAS_VBR	VDG211	Afrikaans	3 + 0	K1	4
A study of macro-nutrients with regard to the basic chemical composition and properties, basic digestion, absorption, metabolism, functions, food sources, symptoms of deficiency and toxicity, reference values. Energy metabolism.					
Prerequisites: [FSG110 or VDG163] and [FSG120 or VDG163]					
VDG252	DIET GUIDELINES 252				
NAS_VBR	VDG211	Afrikaans	2 + 0	K1	3
Recommended dietary allowances – origin and application. Nutrient guidelines, dietary goals and guidelines. Food composition tables – application in food and diet analysis.					
Prerequisites: [FSG110 or VDG163] and [FSG120 or VDG163]					
VDG253	VITAMINS, MINERALS AND WATER 253				
NAS_VBR	VDG211	Afrikaans	3 + 0	K2	4
A study of vitamins, minerals and water with regard to the basic chemical composition and properties, basic digestion, absorption, metabolism, functions, food sources, symptoms and toxicity, reference values.					
Prerequisites: [FSG110 or VDG163] and [FSG120 or VDG163]					
VDG254	PLANNING FAMILY MEALS 254				
NAS_VBR	VDG211	Afrikaans	2 + 0	K2	3
Dietary guides. Theory of planning balanced family meals and menus. Ration scales. Portion sizes.					
Prerequisites: [FSG110 or VDG163] and [FSG120 or VDG163]					
VDG255	FOUNDATIONS OF NUTRITION 255				
NAS_VBR	n a	English	3 + 0	K1	6
Cell and tissue, digestive system, absorption and metabolism, energy metabolism and balance. Study of macro-nutrients with regard to the composition, properties, functions, food sources and symptoms of deficiency and toxicity.					
VDG256	BASIC PRINCIPLES OF NUTRITION 256				
NAS_VBR	n a	English	3 + 0	K2	6
A study of micro-nutrients with regard to the composition, properties, functions, food sources and symptoms of deficiency and toxicity. Food groups and dietary guides.					
VDG361	NUTRITION DURING THE LIFE CYCLE 361				
NAS_VBR	VDG320	Afrikaans	3 + 1	K3	7
The role of nutrition in the life cycle.					
Prerequisites: [VDG251] and [VDG252] and [VDG253] and [VDG254]					
VDG362	NUTRITION DURING THE LIFE CYCLE 362				
NAS_VBR	VDG320	Afrikaans	3 + 1	K4	7
The role of nutrition in the prevention of lifestyle related diseases - osteoporosis, cancer, coronary heart disease, tooth decay. Vegetarianism. Different conditions of malnutrition: Protein Energy Malnutrition and obesity.					
Prerequisites: [VDG251] and [VDG252] and [VDG253] and [VDG254]					
VDG363	NUTRITION DURING THE LIFE CYCLE 363				
NAS_VBR	n a	English	3 + 1	K3	10
The role of nutrition in the life cycle.					
Prerequisites: [VDG255] and [VDG256]					

VDG483	COMMUNITY NUTRITION 483				
NAS_VBR	n a	English	3 + 0	S1	20
Basic principles of community nutrition. Nutritional assessment. Nutrition problems and programmes in Southern African communities.					
Prerequisites: [KEP261] and [KEP262] and [VDG255] and [VDG256] and [VDG363]					
VDS151	GLOBAL FOOD SUPPLY 151				
NAS_VBR	VDS110	Afrikaans	3 + 0	K1	4
Global food production and supply. Global food shortages and food aid programmes.					
VDS152	QUALITY CONTROL OF FOOD IN SOUTH AFRICA 152				
NAS_VBR	VDS110	Afrikaans	3 + 0	K2	4
Food legislation. Additives. Food labelling. Consumer rights and consumer protection.					
VDS251	FOOD SYSTEMS AND BASIC FOOD LABORATORY SKILLS 251				
NAS_VBR	VDS210,220	Afrikaans	3 + 1	K1	8
The study of different food systems with reference to the role they play in food preparation. Physical and chemical properties and the influence of the composition in food preparation. Weighing and measuring techniques as applied in food preparation, food preparation equipment and terminology. Preparation methods.					
VDS252	BASIC FOOD PREPARATION 252				
NAS_VBR	VDS210	Afrikaans	3 + 1	K2	8
The composition and physical properties as well as the factors that influence the preparation of the following: soups and sauces; fruit and vegetables; salads; frozen desserts; gelatine. Prerequisite: [VDS251]					
VDS261	BASIC FOOD PREPARATION 261				
NAS_VBR	VDS221	Afrikaans	3 + 1	K3	8
The composition and physical properties as well as the factors that influence the preparation of the following : meat, poultry, fish, eggs and milk. Prerequisite: [VDS251]					
VDS262	BASIC FOOD PREPARATION 262				
NAS_VBR	VDS310	Afrikaans	3 + 1	K4	8
The composition and physical properties, as well as the factors that influence the preparation of the following: starches and cereals; baked products (whole spectrum); leavening agents. Prerequisite: [VDS251]					
VDS321	THEORY OF MENU PLANNING AND APPLICATION 321				
NAS_VBR	n a	English	3 + 1	S2	14
Theory of menu planning an application for the family, households, different cultural groups and different occasions. Theoretical grounding for recipe enlargement and adjustments. Preparation and serving of family meals, formal and buffet functions for the various cultural groups of South Africa.					
Prerequisites: [VDS251] and [VDS252] and [VDS261] and [VDS262]					
VDS351	INTRODUCTION TO CONSUMER FOOD RESEARCH 351				
NAS_VBR	VDS310	Afrikaans	3 + 1	K1	8
Planning executing and reporting consumer food research. Consumer sensory evaluation techniques.					
Prerequisites: [VDS251] and [VDS252] and [VDS261] and [VDS262]					
VDS352	EXPERIMENTAL FOOD PREPARATION 352				
NAS_VBR	VDS310	Afrikaans	3 + 1	K2	8
Experiments in food, emphasising ingredient function and standard preparation methods. Application of experimental methods through which the chemical and physical reactions of food to different food handling, preparation and preservation techniques are illustrated. Quality evaluation of food products.					
Prerequisites: [VDS251] and [VDS252] and [VDS261] and [VDS262]					

VDS353	HOUSEHOLD FOOD PRESERVATION 353				
NAS_VBR	VDS310	English	3 + 1	K1	8
The emphasis will be on household food preservation techniques: drying, fermentation, canning, chilling and freezing, as well as other relevant food preservation trends. Prerequisites: [VDS251] and [VDS252] and [VDS261] and [VDS262]					
VDS354	FOOD SAFETY AND FOOD HYGIENE 354				
NAS_VBR	VDS110	Bilingual	3 + 0	K2	4
Principles of food safety and food hygiene. Note: this module is repeated in the fourth term for some programmes of study.					
VDS361	LARGE-SCALE MENU PLANNING, PROCUREMENT AND FOOD PREPARATION 361				
NAS_VBR	VDS320	Afrikaans	5 + 2	S2	30
MODULE 1 AND PRACTICAL WORK: Principles of large-scale food preparation and the practical application thereof in a practical restaurant situation. Restaurant management. Recipe formats and adjustment applicable to large-scale food preparation. Work scheduling and the practical exposure to the use of large scale catering equipment in a real life situation. MODULE 2: Menu planning for different food service systems and styles of food service MODULE 3: Large-scale food procurement, consumption and storage. Prerequisites: [KEP261] and [VDS251] and [VDS252] and [VDS261] and [VDS262]					
VDS363	LARGE SCALE FOOD PROCUREMENT AND PREPARATION 363				
NAS_VBR	n a	English	3 + 1	S2	15
Principles of large-scale food procurement and food preparation. Recipe enlargement for large-scale food preparation. Menu planning for groups and special functions. Prerequisites: [VDS251] and [VDS252] and [VDS261] and [VDS262]					
VDS451	RECIPE DEVELOPMENT 451				
NAS_VBR	VDS413	Afrikaans	3 + 2	K1	8
Recipe development process and development of appropriate recipes for a given situation. Prerequisite: [VDS352]					
VDS452	RECIPE STANDARDISATION AND FOOD STYLING 452				
NAS_VBR	VDS413	Afrikaans	3 + 2	K2	8
Standardisation of recipes. Food styling and food photography. Prerequisite: [VDS361]					
VDS453	CULINARY ART 453				
NAS_VBR	n a	Afrikaans	2 + 1	K1	7
Advanced food preparation techniques with regard to: baked products such as bread, cakes, pastries, desserts. Prerequisites: [VDS251] and [VDS252] and [VDS261] and [VDS262]					
VDS454	CULINARY ART 454				
NAS_VBR	n a	Afrikaans	2 + 1	K2	7
Advanced food preparation techniques with regard to: starters, side dishes and sauces. Prerequisites: [VDS251] and [VDS252] and [VDS261] and [VDS262]					
VDS455	VISUAL MERCHANDISING OF FOOD 455				
NAS_VBR	n a	Afrikaans	3 + 0	K1	4
Aspects of food retailing with special emphasis on food packaging and labelling of food products.					
VDS456	VISUAL MERCHANDISING OF FOOD 456				
NAS_VBR	n a	Afrikaans	3 + 0	K2	4
Aspects of food retailing with regard to display, presentation and shop layout as applied to food products. Prerequisite: [VDS455]					

VDS461	CONSUMERISM AND FOOD PRODUCT ADVICE 461				
NAS_VBR	VDS423	Afrikaans	3 + 0	S2	8
MODULE 1: Factors influencing food consumption, consumer behaviour and food choice. MODULE 2: Food product advice. Consumer advice, marketing of food products, consumer education.					
VDS462	PROJECT FOODS: VISUAL MERCHANDISING 462				
NAS_VBR	n a	Afrikaans	3 + 0	K4	4
Practical application of theoretical principles of visual merchandising of food and consumer aspects in food retailing. Prerequisites: [VDS456] and [VDS461]					
VDS463	FOOD RESEARCH PROJECT 463				
NAS_VBR	VDS422	Afrikaans	1 + 2	S2	20
Research methodology. Planning, executing and reporting a research project in a food-related field. Prerequisite: [VDS351 or VDS352]					
VDS464	CULINARY ART 464				
NAS_VBR	n a	Afrikaans	2 + 1	K3	7
Advanced food preparation techniques with regard to: meat, poultry, fish and shellfish. Prerequisites: [VDS251] and [VDS252] and [VDS261] and [VDS262]					
VDS465	CULINARY ART 465				
NAS_VBR	n a	Afrikaans	2 + 1	K4	7
Project: event planning and banqueting. Prerequisites: [VDS251] and [VDS252] and [VDS261] and [VDS262]					
VGE301	NUTRITIONAL SCIENCE 301				
NAS_VKU	n a	English	3 + 0.5	J1	32
Digestion and metabolism of feeds. The division of food energy and food energy systems. Protein quality and requirements. Mineral and vitamin requirements. Nutritional standards. Voluntary intake. Water quality. Characteristics of fodder. Rumen function and microbial fermentation. Practical work: In vivo and in vitro digestibility studies. Prerequisites: [BCM261] and [BCM262] and [DAF250] and [DAF260] and [VDG250] and [VKU220]					
VGE411	NUTRITIONAL SCIENCE 411				
NAS_VKU	n a	English	4 + 0.5	S1	18
Specialised nutrition of monogastric animals: poultry, pigs, horses and selected freshwater aquatic organisms. The use of computer systems in feeding management. Prerequisite: [VGE301]					
VGE421	NUTRITION SCIENCE 421				
NAS_VKU	n a	English	3 + 0.5	S2	16
Specialized small stock and game nutrition. Nutrition of rams, ewes and lambs for optimal production. Principles of creep feeding, drought feeding, winter and supplementary feeding. Feeding pen nutrition and final nutritional preparation of lambs. Influence of nutrition on wood, pelts and Angora wool. Nutrition of meat and milk goats. Fodder flow planning. Prerequisite: [VGE301]					
VGE423	NUTRITION SCIENCE 423				
NAS_VKU	n a	English	3 + 0.5	S2	16
Specialized nutrition of beef and dairy cattle according to production systems. The use of computer systems in feeding management. The practicals will include compiling rations in terms of requirements and least cost formulations, specialised assignments and on-farm experiential training. Prerequisite: [VGE301]					

VHK262	DIDACTICS: HOME ECONOMICS 262				
NAS_VBR	n a	Bilingual	0 + 1	K4	6
The study field of Didactics: Home Economics: Introduction, goals, lesson structure, methodological principles; practical and laboratory organisation. Examples of theme study from the secondary school level.					
VHK351	DIDACTICS: HOME ECONOMICS 351				
NAS_VBR	n a	Bilingual	4 + 1	K1	18
The study field of Didactics: Home Economics: Examples of theme study from the secondary school syllabus of Home Economics for Grade 10 and 11, the reduction of learning content, evaluation of the school subject. Principles of lesson design.					
Prerequisite: [VHK262]					
VHK400	DIDACTICS: HOME ECONOMICS 400				
NAS_VBR	n a	Bilingual	0 + 1	J1	12
The study field of Didactics: Home Economics: Examples of theme study from the secondary school syllabus of Home Economics for Grade 12, the reduction of learning content, evaluation of the school subject. Principles of lesson design.					
Prerequisite: [VHK351]					
VHS262	DIDACTICS: HOTELKEEPING AND CATERING 262				
NAS_VBR	n a	Bilingual	0 + 1	K4	6
The study field of Didactics: Hotelkeeping and Catering: Introduction, goals, lesson structure, methodological principles, practical and laboratory organisation. Examples of theme study at secondary school level.					
VHS351	DIDACTICS: HOTELKEEPING AND CATERING 351				
NAS_VBR	n a	Bilingual	4 + 1	K1	18
The study field of Didactics: Hotelkeeping and Catering: Examples of theme study from the secondary school syllabus of Home Economics for Grade 10, and 11, the reduction of learning content, evaluation of the school subject. Principles of lesson design.					
Prerequisite: [VHS262]					
VHS400	DIDACTICS: HOTELKEEPING AND CATERING 400				
NAS_VBR	n a	Bilingual	0 + 1	J1	12
The study field of Didactics: Hotelkeeping and Catering: Examples of theme study from the secondary school syllabus of Home Economics for Grade 12, the reduction of learning content, evaluation of the school subject. Principles of lesson design.					
Prerequisite: [VHS351]					
VKD410	PIG SCIENCE 410				
NAS_VKU	n a	Afrikaans	1 + 0.5	S1	8
Industrial science and management of pigs – sow, boar and growing pigs. Production systems and feeding systems. Design and utilization of housing facilities. Product quality and marketing. Hygiene and herd health programmes.					
Prerequisites: [LEK210] and [VGE301] and [VKU220] and [VNE361]					
VKF411	ANIMAL SCIENCE PHARMACOLOGY 411				
NAS_VKU	n a	Afrikaans	3 + 0	S1	12
The pharmacology, laws, control and use of substances for animal production.					
Prerequisites: [DFS20] and [VGE301]					
VKK155	FOUNDATIONS OF VISUAL LANGUAGE 155				
GW_GW	n a	Bilingual	3 + 0	K1	6
Study of the form, content and aims of static and moving images in diverse media (for example, fine arts and design). Introduction to the scientific and systematic analysis and interpretation of visual images and visual media. Formalistic analysis. Introduction to visual language and the visual communication process. Visual communication and visual					

literacy in relation to cultural conventions and codes, visual metaphors, icons, symbols, myths and ideology.					
VKK257	STYLE AND ANTI-STYLE 1940 TO PRESENT 257				
GW_GW	n a	Bilingual	2 + 0	K3	10
Changes in the appearance of visual culture from 1940 to the present. Contextualisation of popular visual culture and consumer culture. Influence of youth- and sub-cultures such as Beatniks, Hippies, Punks, and Grunge on contemporary design styles. Influence of cultural codes and conventions on design styles. Description and contextualisation of design styles with reference to South Africa.					
VKK258	VISUAL IDENTITY AND BRANDING 258				
GW_GW	n a	Bilingual	2 + 0	K4	10
The aims and functions of visual communication in the marketing context. Visual communication as foundation for the creation of corporate, product and brand identity, as well as advertising and promotion. Methods of analysis and evaluation of advertisements and visual identity. Influence of target audience and media characteristics on visual communication.					
VKK353	DECODING VISUAL CULTURE 353				
GW_GW	n a	Bilingual	2 + 0	K3	15
Critical decoding of culturally encoded ideas and ideologies as embodied in visual culture. The emphasis is placed on the semiotic decoding of aspects of visual culture. Application to clothing and South African identity; entertainment landscapes and theme parks in South Africa, and the 'myth of Africa'. The necessity of a critical attitude towards visual messages.					
VKU210	INTRODUCTION TO ANIMAL SCIENCE 210				
NAS_VKU	n a	English	1 + 0.5	S1	6
A global overview of the livestock industry. Historical background on the origin of animals. Principles of animal production.					
VKU211	INTRODUCTION TO ANIMAL BREEDING 211				
NAS_VKU	n a	English	2 + 0.5	S1	6
General principles of breeding of farm stock, namely large stock, small stock, poultry and pigs. Heredity and race improvement.					
VKU220	ANIMAL PRODUCTION SYSTEMS 220				
NAS_VKU	n a	English	2 + 0.5	S2	12
Introduction to the basic principles and terminology of large stock, small stock, pig and poultry production systems. Prerequisite: [VKU210]					
VKU221	ANIMAL PRODUCTION MANAGEMENT 221				
NAS_VKU	n a	English	1 + 0.5	S2	6
The management of farm stock. Reproduction, health, housing and farm structures. Production systems and general feeding. Supplementary nourishment. Economy of feeding.					
VKU222	INTRODUCTION TO ANIMAL NUTRITION 222				
NAS_VKU	n a	English	2 + 0	S2	6
The chemical composition of fodder. Digestive processes and the digestibility of fodder. The nutrition and nutritional requirements of farm stock. Basic composition of rations. Intensive and extensive feeding.					
VKU361	ANIMAL ECOLOGY 361				
NAS_VKU	VNE310	Bilingual	2 + 0	K3	8
Animal ecology, interaction between genotype and environment. Animal-ecological factors which influence regional classification. Animal ecology factors which must be taken into					

consideration in the obtaining of the production factors, planning and management of the cattle farming enterprise. Conservation farming and adapted farming and management systems; environmental conservation. Prerequisites: [VKU210] and [VKU220]					
VKU362	ANIMAL SCIENCE BIOTECHNOLOGY 362				
NAS_VKU	n a	Bilingual	2 + 0.5	K4	8
A review of the structure, function and replication of nucleic acids. Mechanism of gene-expression and the association with metabolic and physiological processes. Function of genes and gene products. Molecular and biochemical terms associated with genetic and physiological variation in farm animals. Basic principles of molecular and physiological techniques, including DNA extraction, PCR technology, electrophoresis, spectrophotometry and ELISA. Emphasis is placed on the practical value of biotechnology in animal science. Prerequisite: [GTS226]					
VKU411	SEMINAR 411				
NAS_VKU	n a	Afrikaans	1 + 0	S1	8
Literature studies and seminars in Animal Science. Prerequisite: [TDH]					
VKU412	RESEARCH METHODOLOGY 412				
NAS_VKU	n a	Afrikaans	1 + 0	S1	8
Research methodology in Animal Science: Handling of queries, introduction to the problem, approach to problem solving, reporting. Practice. Prerequisite: [TDH]					
VLG351	EXTENSION 351				
NAS_VBR	VLG310	Afrikaans	1 + 2	K1	6
Principles and procedures of adult education.					
VLG352	EXTENSION 352				
NAS_VBR	VLG310	Afrikaans	1 + 2	K2	6
Development of media. Demonstrations and presentation methods. Prerequisite: [Fourth-year status]					
VLG361	EXTENSION 361				
NAS_VBR	VLG320	English	1 + 2	K3	6
Community development. Prerequisites: [VLG351] and [VLG352]					
VLG362	EXTENSION 362				
NAS_VBR	VLG320	English	1 + 2	K4	6
Initiation of and participation in community development projects. Prerequisites: [VLG351] and [VLG352]					
VSX420	MEAT AND DAIRY SCIENCE 420				
NAS_VKU	n a	Afrikaans	2 + 0.5	S2	10
Meat industry. Meat species. Composition of carcass and meat, slaughtering process and meat quality. Hygiene and marketing. The role of the producer, wholesale and retail dealers and the consumer. Dairy industry. Composition and nutritional value of milk and factors that influence it. Lactation. Milk production, milk quality and marketing. Prerequisite: [DFS320]					
VVW350	FOOD AND HEALTH 350				
NAS_VDW	n a	Bilingual	4 + 1	S1	36
The science of food for lifestyles – sport nutrition, nutrition for prevention of disease.					
VVW361	FOOD LEGISLATION AND LABELLING FOR ANIMAL AND HUMAN FOOD 361				
NAS_VDW	n a	Bilingual	4 + 1	K3	18
National and international standards, Codex Alimentarius, FDA. Application of food legislation at the consumer level.					

VVW362	COMMUNICATION IN NUTRITION 362				
NAS_VDW	n a	Bilingual	4 + 0	K4	18
Theory and practical exercises in communicating the science and practice of nutrition to scientists, the food industry, nutritional practitioners and lay persons. Presentation skills. Project management.					
VVW363	COMMUNITY NUTRITION AND PUBLIC HEALTH 363				
NAS_VDW	n a	Bilingual	4 + 1	K3	18
The theory and practice of community nutrition and public health. Dietary supplementation, enrichment and fortification.					
WDE251	RANGELAND MANAGEMENT 251				
NAS_PGW	WDE310	Afrikaans	2 + 0.5	K1	6
The influence of biotic and abiotic factors on the productivity of different strata and components of natural pastures. This will enable the student to advise users, with the necessary motivation, on the appropriate use of these strata and components and will form a basis for further research on this system. Prerequisite: [PPK251 #]					
WDE252	RANGELAND MANAGEMENT 252				
NAS_PGW	WDE310	Afrikaans	2 + 0.5	K2	6
The principles of veld management systems and the influence of management practices on sustainable animal production from natural pastures. This will enable the student to advise users on veld management and veld management principles. It will also form a basis for further research on veld management. Prerequisite: [WDE251]					
WDE271	VELD MANAGEMENT PRACTICES 271				
NAS_PGW	WDE210	English	2 + 0.5	K1	6
The influence of environmental factors and defoliation on the productivity of the different components of the grazing ecosystem. This will enable the student to motivate users to manage this ecosystem with the necessary care. Prerequisite: [PPK251 #]					
WDE272	VELD MANAGEMENT PRACTICES 272				
NAS_PGW	WDE210	English	2 + 0.5	K2	6
Management practices for sustainable animal production from natural pastures. This will enable the student to advise farmers on different management systems and practices. Prerequisite: [WDE271]					
WDE350	PLANTED PASTURES 350				
NAS_PGW	WDE320	Bilingual	2 + 0.5	S1	14
The establishment and use of planted pastures species and fodder crops and the conservation of fodder. This will enable students to advise users on planted pastures species as well as farmers on the production, conservation and optimum use of fodder. This will also form a basis for further research on planted pastures. Prerequisites: [WDE271 or WDE251] and [WDE272 or WDE252]					
WDE450	EVALUATION OF RANGE AND FORAGES 450				
NAS_PGW	WDE421	Bilingual	3 + 0.5	S1	14
Concentrates on baseline information (for extension and research purposes) and monitoring evaluation techniques to provide information on composition, cover, ecological status, responses to grazing gradients and management systems, as well as agronomic and animal production (the latter being an interaction between plant productivity, nutritive value of plants, nutritional requirements of animals and management systems) of both natural and planted pastures. Such information is essential in developing production systems based on these resources and especially to facilitate adaptive management responses in management strategies.					

WDE451	PRODUCTION SYSTEMS V: VELD MANAGEMENT 451				
NAS_PGW	WDE481	English	2 + 0.5	K1	6
Development of veld management strategies through the integration of ecological and physiological principles with economic and sociological limitation to achieve production objectives, while ensuring the reclamation and conservation of natural resources.					
WDE452	PRODUCTION SYSTEMS V: FORAGE CROPS AND PRODUCTION 452				
NAS_PGW	WDE482	English	2 + 0.5	K2	6
Identification of adapted fodder crops and pastures (including grass, leguminous plants, fodder trees and drought-resistant crops) for specific agro-ecological areas and socio-economic conditions. Management practices with regard to establishment, fertilization, irrigation and utilization.					
WDE460	PRODUCTION SYSTEMS VI: INTEGRATION OF PLANT AND ANIMAL PRODUCTION 460				
NAS_PGW	WDE483	English	2 + 0.5	S2	6
The role of crop rotation alley cropping and leys in marginal areas to ensure sustainable production. Integration of fodder production with other agricultural enterprises to yield wood/vegetables/fruit/nuts, cash crops and animal products. Fodder supply to commercial and communal animal production systems.					
WDE461	TURF-GRASS MANAGEMENT 461				
NAS_PGW	WDE412	Bilingual	2 + 1	K3	7
Based on a fundamental knowledge of plant structure, taxonomy and functioning with particular attention to aspects of soil profiles, soil textures, irrigation, fertilization and crop protection (control of weeds, insects and diseases) this course concentrates on the identification of suitable species, their establishment and maintenance requirements. Particular emphasis is placed on the identification and solving of problems.					
WDE470	EVALUATION OF RANGE AND FORAGES 470				
NAS_PGW	WDE424	English	3 + 0	S1	10
<i>Capita selecta</i> from Evaluation of Range and Forages 450.					
WKD151	ATMOSPHERIC PROCESSES 151				
NAS_GGY	WKD151	English	4 + 0.6	K1	8
Weather and climate. Origin and composition of the atmosphere. Oxygen, carbon and life. Meteorological instruments. Temperature distribution and heat capacity. Atmospheric mass and pressure. Radiation. Zenith angle of the sun. Heat transfer in the boundary layer. Atmospheric heat budget. Urban and rural climates. Equation of state. Air parcel theory. Phases of water and latent heat. Vapour and saturated vapour pressure. Dew point temperature and relative humidity. Dry adiabatic, wet adiabatic and environmental temperature lapse rates. Cloud development. Sensible heat. Comfort zones. Acquisition of data from the SA Weather Bureau: Composition and submission of a report.					
WKD152	ATMOSPHERIC CIRCULATION AND CLIMATE 152				
NAS_GGY	WKD152	English	4 + 0.6	K2	8
Hadley and Walker (ENSO) cells. Convergence, divergence, convection and subsidence. Polar stratospheric ozone. Air parcel theory. Angular velocity of the Earth. Gravitational, centrifugal forces: Gravity, pressure gradient, Coriolis and friction force. Rotation of a cyclone and anti-cyclone. Geostrophic wind. Inter-tropical convergence zone (ITCZ). Monsoon rain. Mid-latitude cyclonic frontal systems. Cut-off low. Coastal lows. Jet streams. Tropical cyclones. Foehn effect. Climate and climate change. Typical circulation patterns over South Africa. Composition and submission of a report.					
WKD161	PHYSICAL AND MESO SCALE METEOROLOGY 161				
NAS_GGY	WKD161	English	4 + 0.6	K3	8
Electromagnetic spectrum. Planck's constant. Radiation energy. Irradiance and radiance. Albedo. Stefan Boltzman law. Global energy balance. First law of thermodynamics.					

Stability and instability. Atmospheric particles. Homogenous and heterogeneous nucleation. Droplet growth. Lightning. Phases of an air mass thunderstorm. Multi-cell storms. Orographic clouds and Lee waves. Cloud identification. Radiation and advection fog. Case study of a local thunderstorm. Composition and submission of a report.					
WKD162	DYNAMICAL and NUMERICAL METEOROLOGY 162				
NAS_GGY	WKD162	English	4 + 0.6	K4	8
Dimensions and units. Atmospheric scales of motion. Hydrostatic assumption. Hypsometric equation. Statistical seasonal assessment and the ENSO. Spatial data interpretation and grid fields. Representation of isobars and the geostrophic wind. Reduction of the height of the 500hPa pressure level. Equations for the pressure gradient and Coriolis forces. Vorticity and divergence. Numerical estimation of the geostrophic wind, vorticity and divergence. Advection of temperature. Development of a two-dimensional numerical temperature advection model: Composition and submission of a report.					
WKD163	WEATHER FORECASTING PRINCIPLES 163				
NAS_GGY	WKD163	English	4 + 0	K4	8
Classification of weather types. Synoptic and METAR messages. Weather data on the Internet. Introduction to satellite images, tephigrams and synoptic charts.					
WKD251	INTRODUCTION TO WEATHER FORECASTING 251				
NAS_GGY	WKD251	English	5 + 0	K1	12
Synoptic codes: METAR, upper air, land and ship. Chart analysis, analysis of satellite images and the tephigram. Introduction to marine forecasting.					
WKD252	WEATHER FORECASTING TECHNIQUES 252				
NAS_GGY	WKD252	English	5 + 0	K2	12
Description, evaluation and interpretation of numerical products. Trough-ridge systems. Sutcliff's theory. Maritime and continental clouds. Compilation of a weather forecast. Marine forecasting. Prerequisite: [WKD251]					
WKD253	COMMUNITY PROJECT 253				
NAS_GGY	WKD253	English	3 + 0	S1	12
Identification and execution of a community project with the aim to provide meteorological information to the general South African public. A project proposal including a budget will be drawn up before the project commences and a project report will be drawn up after completion of the project.					
WKD261	PHYSICAL METEOROLOGY 261				
NAS_GGY	WKD261	English	4 + 0	K3	12
Conservative forces and conservation laws. Basic thermodynamic laws for dry and humid air. The equation of state. Adiabatic processes and temperature lapse rates. The Clausius-Claperton equation. Calculation of the wet adiabat.					
WKD262	CLIMATE DATA MANIPULATION 262				
NAS_GGY	WKD262	English	0 + 1	K4	12
Introduction to GIS, time series, data analyses and graphical display, elementary statistical and numerical analyses.					
WKD351	ATMOSPHERIC BALANCE LAWS 351				
NAS_GGY	WKD351	English	4 + 0.6	K1	18
Acceleration in rotating co-ordinates, fundamental forces, momentum equation, one, two and three dimensional flow balance, conservation of mass, heat equation, thermodynamic energy equation.					
WKD352	ATMOSPHERIC VORTICITY AND DIVERGENCE 352				
NAS_GGY	WKD352	English	4 + 0.6	K2	18
Scale analyses and simplification of the basic equations. The geostrophic, thermal and gradient wind. The vorticity equation and divergence.					

WKD361	QUASI-GEOSTROPHIC ANALYSIS 361				
NAS_GGY	WKD361	English	4 + 0	K3	18
Tendency and Omega equations. Model of a baroclinic system. Introduction to numerical models.					
WKD362	CLOUD AND BOUNDARY LAYER DYNAMICS 362				
NAS_GGY	WKD362	English	4 + 0	K4	18
Introduction to cloud dynamics. Classification and development of clouds. Cumulonimbus clouds, super cell storms and tornadoes. Planetary boundary layer, atmospheric turbulence, Reynolds average, turbulent kinetic energy, the Ekman layer, secondary circulation.					
WKD363	OPERATIONAL RESEARCH 363				
NAS_GGY	WKD363	Bilingual	0 + 0.6	K3	18
Research mythology: identification of research project, compilation of research proposal, literature survey, acquisition and manipulation of data.					
WKD364	RESEARCH PRESENTATION 364				
NAS_GGY	WKD364	Bilingual	0 + 0.6	K4	18
Introduction to innovative strategy. Preparation of research report / paper. Presentation of research at conferences. Prerequisite: [WKD363]					
WKE420	WILDLIFE SCIENCE 420				
NAS_VKU	n a	Afrikaans	2 + 0.5	S2	10
Introductory aspects of wildlife conservation, habitat management, wildlife nutrition and keeping wildlife in game reserves. Prerequisites: [VGE301] and [VKU361] or [TDH]					
WLK410	WOOL SCIENCE 410				
NAS_VKU	n a	Afrikaans	2 + 0.5	K1	8
Development of follicles and growth of wool. The morphology, physical and chemical characteristics of wool fibre. The classing, marketing and processing of wool. Physical testing. Regulations with regard to the classing and packaging of wool. Class standards of the NWGA. Prerequisites: [TLR320] and [VGE301]					
WST110	MATHEMATICAL STATISTICS 110				
NAS_WST	n a	Double	4 + 1	S1	16
Sampling methods. Exploratory data analysis. Classification of data, graphical representations, elementary descriptive measures. More advanced descriptive methods. Probability calculation. Introductory distribution theory and statistical inference: Point and interval estimation. Identification, use, evaluation and interpretation of statistical computer packages and statistical techniques. Prerequisite: [Par 1.2]					
WST120	MATHEMATICAL STATISTICS 120				
NAS_WST	n a	Double	4 + 1	S2	16
Statistical inference: Hypothesis testing with applications in one and two-sample cases. Analysis of variance. Distribution-free methods. Correlation and regression. Introductory categorical data analysis. Indices. Curve fitting. Time series analysis. Identification, use, evaluation and interpretation of statistical computer packages and statistical techniques. Report writing. Prerequisite: [WST110 GS]					
WST210	MATHEMATICAL STATISTICS 210				
NAS_WST	WST210	Double	4 + 2	S1	24
Set theory. Probability theory. Random variables. Special distributions: Bernoulli, binomial, hypergeometric, geometric, negative binomial, Poisson, uniform, gamma, exponential and normal. Joint distributions. Independent random variables. Conditional distributions. Bivariate normal distribution. Functions and transformations of random variables.					

Identification, use, evaluation and interpretation of statistical computer packages and statistical techniques.					
Prerequisites: [WST110] and [WST120] and [WTW114 GS or WTW101 GS] and [WTW126 GS or WTW102 GS] and [WTW128 GS or WTW102 GS]					
WST220	MATHEMATICAL STATISTICS 220				
NAS_WST	WST220	Double	4 + 2	S2	24
Limit distributions and the central limit theorem. Sampling distribution: chi-square, t, beta and F. Point estimation. Interval estimation. Tests of hypotheses. Multivariate normal distribution. Linear regression. Markov chains. Identification, use, evaluation and interpretation of statistical computer packages and statistical techniques.					
Prerequisite: [WST210 GS]					
WST310	MATHEMATICAL STATISTICS 310				
NAS_WST	WST310	Bilingual	4 + 2	S1	36
Matrix methods in Statistics: generalised inverses, vector spaces and projections. Multivariate statistical distributions: moment generating functions, multivariate normal distribution, conditional distributions, quadratic forms, discrete multivariate distributions. The linear model: theoretical model, estimation of linear functions, generalised t- and F-tests, linear regression, analysis of variance. Regression analysis: single and multiple regression, residual analysis, analysis of variance, selection methods, dummy variables. Identification, use, evaluation and interpretation of statistical computer packages and statistical techniques.					
Prerequisites: [WST210] and [WST220] and [WTW211 GS] and [WTW218 GS]					
WST361	MATHEMATICAL STATISTICS 361				
NAS_WST	WST320(1)	Bilingual	2 + 1	K3	18
Estimation and test theory: methods of obtaining estimators and properties of estimators. Uniformly most powerful tests and the maximum likelihood criterion with applications. Design of experiments. Identification, use, evaluation and interpretation of statistical computer packages and statistical techniques.					
Prerequisites: [WST210] and [WST220] and [WTW211 GS] and [WTW218 GS]					
WST362	MATHEMATICAL STATISTICS 362				
NAS_WST	WST320(2)	Bilingual	2 + 1	K4	18
Distribution-free methods: one, two and multi-sample rank tests. Linear rank test statistics with applications. Rank correlation. Asymptotic relative efficiency. Student seminars. Identification, use, evaluation and interpretation of statistical computer packages and statistical techniques.					
Prerequisites: [WST210] and [WST220] and [WTW211 GS] and [WTW218 GS]					
WTW101	MATHEMATICS 101				
NAS_WTW	n a	Double	4 + 1	J1	16
This course includes the syllabus of Calculus 114, as well as enrichment. Enrichment includes computer-based modules. Real numbers and the coordinate plane. Functions and their zeros. Polynomials. Exponential and logarithmic functions. Vector Algebra. Functions, limits and continuity. Differential calculus of single variable functions, rate of change, graph sketching, optimisation and applications. The mean value theorem, the rule of L'Hospital. Definite and indefinite integrals, the fundamental theorem of Calculus, the mean value theorem for integrals, integration techniques. (4 lectures, 1 computer session, 1 tutor session)					
Prerequisite: [Par 1.2]					
WTW102	MATHEMATICS 102				
NAS_WTW	n a	Double	4 + 1	J1	16
This course includes the syllabi of Calculus 128 and Linear Algebra 126, as well as enrichment. Enrichment includes computer-based modules. This course follows WTW101.					

<p>Integration techniques, improper integrals. Applications of integration, elementary differential equations. Elementary power series and Taylor's theorem. Conic sections. Vector functions, space curves and arc lengths. Quadric surfaces and multivariable functions. Matrices and their algebra, systems of linear equations, subspaces of R^n, bases, determinants. Mathematical induction. Complex numbers and factorisation of polynomials. (4 lectures, 1 tutorial and 1 computer session) Prerequisite: [WTW114 GS or WTW101 GS]</p>					
WTW114	CALCULUS 114				
NAS_WTW	n a	Double	4 + 1	S1	16
<p>Vector Algebra with applications to geometry. Functions, limits and continuity. Differential calculus of single variable functions, rate of change, graph sketching, applications. The mean value theorem, the rule of L'Hospital. Definite and indefinite integrals, the fundamental theorem of Calculus, the mean value theorem for integrals, integration techniques. This course serves as preparation for students majoring in Mathematics (including all students who intend to enrol for WTW 218 and WTW 220). Students will not be credited for more than one of the following modules for their degree: WTW 114, WTW 158, WTW 134. This course also includes a formal technique mastering programme. (4 lectures and 1 tutorial of 3 hours) Prerequisite: [Par 1.2]</p>					
WTW115	DISCRETE STRUCTURES 115				
NAS_WTW	n a	Double	2 + 1	S1	8
<p>Propositional logic: truth tables, logical equivalence, implication, arguments. Mathematical induction and well-ordering principle. Counting techniques: elementary probability, multiplication and addition rules, permutations and combinations, binomial theorem, inclusion-exclusion rule. (2 lectures and 1 tutorial of 1½ hours) Prerequisite: [Par 1.2]</p>					
WTW123	NUMERICAL ANALYSIS 123				
NAS_WTW	n a	Double	2 + 1	S2	8
<p>Non-linear equations, numerical integration, initial value problems for differential equations, systems of linear equations. Algorithms for elementary numerical techniques are derived and implemented in computer programs. Error estimates and convergence results are treated. (2 lectures and 1 tutorial of 1½ hours) Prerequisite: [WTW114 GS or WTW101 GS]</p>					
WTW126	LINEAR ALGEBRA 126				
NAS_WTW	n a	Double	2 + 1	S2	8
<p>Vector Algebra with applications, matrix algebra, systems of linear equations, the vector space R^n, bases, determinants. Mathematical induction. Complex numbers and factorisation of polynomials. Conic sections. This course serves as preparation for students majoring in Mathematics (including all students who intend to enrol for WTW 211). Students will not be credited for more than one of the following modules for their degree: WTW 126, WTW 161. This course also includes a formal technique mastering programme. (2 lectures and 1 tutorial of 1½ hours) Prerequisite: [Par.1.2]</p>					
WTW128	CALCULUS 128				
NAS_WTW	n a	Double	2 + 1	S2	8
<p>Integration techniques, improper integrals. Applications of integration, introduction to differential equations. Elementary power series and Taylor's theorem. Vector functions, space curves and arc lengths. Quadric surfaces and multivariable functions. This course serves as preparation for students majoring in Mathematics (including all students who intend to enrol for WTW 218 and WTW 220). Students will not be credited for more than one of the following modules for their degree: WTW 128, WTW 168, WTW 144. This</p>					

course also includes a formal technique mastering programme. (2 lectures and 1 tutorial of 1½ hours)					
Prerequisite: [WTW114 GS or WTW101 GS]					
WTW134	MATHEMATICS 134				
NAS_WTW	n a	Double	4 + 1	S1	16
Functions, derivatives, interpretation of the derivative, rules of differentiation, applications of differentiation, integration, interpretation of the integral, applications of integration. Discrete probability, matrices, solutions of systems of equations. Students will not be credited for more than one of the following modules for their degree: WTW 134, WTW 114, WTW 158. WTW 134 does not generally lead to admission to Mathematics at 200 level and is intended for students who require Mathematics at 100 level only. In exceptional circumstances, however, students who have obtained exceptional marks in WTW 134 and WTW 144, may be admitted to Mathematics at 200 level, with permission from the head of the department. (4 lectures, 1 tutorial of 1½ hours and 1 computer session of 1 hour)					
Prerequisite: [Par 1.2]					
WTW144	MATHEMATICS 144				
NAS_WTW	n a	Bilingual	4 + 1	S2	16
Further applications of Calculus, graph sketching, differential equations with applications. Calculus of multivariable functions. Difference equations, basic statistics, discrete and continuous probability distributions. Students will not be credited for more than one of the following modules for their degree: WTW 144, WTW 128, WTW 168. WTW 144 does not generally lead to admission to Mathematics at 200 level and is intended for students who require Mathematics at 100 level only. In exceptional circumstances, however, students who have obtained exceptional marks in WTW 134 and WTW 144, may be admitted to Mathematics at 200 level, with permission from the head of the department. (4 lectures, 1 tutorial of 1½ hours and 1 computer session of 1 hour)					
Prerequisite: [WTW134 GS]					
WTW152	MATHEMATICAL MODELLING 152				
NAS_WTW	n a	Double	2 + 1	S1	8
Introduction to the modelling of dynamic processes using difference equations. Continuous dynamic systems. Applications to real-life situations in, among others, finance, economics and ecology. (2 lectures and 1 tutorial of 1½ hours)					
Prerequisite: [Par 1.2]					
WTW158	CALCULUS 158				
NAS_WTW	n a	Double	4 + 1	S1	16
Vector Algebra with applications to geometry. Functions, limits and continuity. Differential calculus of single variable functions, rate of change, graph sketching, applications. The mean value theorem, the rule of L'Hospital. Definite and indefinite integrals, the fundamental theorem of Calculus, the mean value theorem for integrals, integration techniques. This course is designed for first-year engineering students as well as students who require Mathematics at 100 level only. Students will not be credited for more than one of the following modules for their degree: WTW 158, WTW 114, WTW 134. This course also includes a formal technique mastering programme. (4 lectures and 1 tutorial of 3 hours)					
Prerequisite: [Par 1.2]					
WTW161	LINEAR ALGEBRA 161				
NAS_WTW	n a	Double	2 + 1	S2	8
Vector algebra with applications, matrix algebra, systems of linear equations, the vector space \mathbb{R}^n , bases, determinants. Mathematical induction. Complex numbers and factorisation of polynomials. Conic sections. This course is designed for first-year					

<p>engineering students who require Mathematics at 100 level only. Students will not be credited for more than one of the following modules for their degree: WTW 161, WTW 126. This course also includes a formal technique mastering programme. (2 lectures and 1 tutorial of 1½ hours)</p> <p>Prerequisite: [Par 1.2]</p>					
WTW162	DYNAMICAL PROCESSES 162				
NAS_WTW	n a	Bilingual	2 + 1	S2	8
<p>Introduction to the modelling of dynamic processes using elementary differential equations. Solution methods for differential equations and analysis of properties of solutions (graphs). Application to real-life situations in, including ecology, economics and finance.(2 lectures and 1 tutorial of 1½ hours)</p> <p>Prerequisites: [WTW114 GS or WTW101 GS] and [WTW152 GS]</p>					
WTW168	CALCULUS 168				
NAS_WTW	n a	Double	2 + 1	S2	8
<p>Integration techniques, improper integrals. Applications of integration, introduction to differential equations. Elementary power series and Taylor's theorem. Vector functions, space curves and arc lengths. Quadric surfaces and multivariable functions. This course is designed for first-year engineering students as well as students who require Mathematics at 100 level only. Students will not be credited for more than one of the following modules for their degree: WTW 168, WTW 128, WTW 144.This course also includes a formal technique mastering programme. (2 lectures and 1 tutorial of 1½ hours)</p> <p>Prerequisites: [WTW114 GS] and [WTW158 GS]</p>					
WTW211	LINEAR ALGEBRA 211				
NAS_WTW	n a	Double	2 + 1	S1	12
<p>Matrices and linear equations, linear independence, real vector spaces and subspaces, eigenvalues, eigenvectors, diagonalisation of matrices, applications of eigenvalue problems, linear transformations. (2 lectures and 1 tutorial of 1½ hours)</p> <p>Prerequisite: [WTW126 or WTW102]</p>					
WTW218	CALCULUS 218				
NAS_WTW	n a	Double	2 + 1	S1	12
<p>Calculus of multivariable functions, directional derivatives. Extrema and Lagrange multipliers. Multiple integrals, polar, cylindrical and spherical coordinates. Line integrals and the theorem of Green. Surface integrals and the theorems of Gauss and Stokes. (2 lectures and 1 tutorial of 1½ hours)</p> <p>Prerequisites: [WTW114 or WTW101] and [WTW128 or WTW102]</p>					
WTW220	ANALYSIS 220				
NAS_WTW	n a	Double	2 + 1	S2	12
<p>Properties of real numbers. Analysis of sequences and series of real numbers. Power series and theorems of convergence. The Bolzano-Weierstrass theorem and the intermediate value theorem. Analysis of real-valued functions on an interval. (2 lectures and 1 tutorial of 1½ hours)</p> <p>Prerequisites: [WTW114 or WTW101] and [WTW128 or WTW102]</p>					
WTW221	LINEAR ALGEBRA 221				
NAS_WTW	n a	Double	2 + 1	S2	12
<p>Change of basis, diagonalisability of linear transformations, orthogonal vectors, unitary and orthogonal transformations, canonical forms, applications. (2 lectures and 1 tutorial of 1½ hours) Prerequisite: [WTW211]</p>					
WTW283	NUMERICAL ANALYSIS 283				
NAS_WTW	n a	Bilingual	2 + 1	S1	12
<p>Numerical integration, initial value problems for differential equations and systems of differential equations (one-step and multi-step methods), systems of non-linear equations.</p>					

Algorithms for numerical techniques are derived and implemented in computer programs. Error estimates and convergence results are proved. (2 lectures and 1 tutorial of 1½ hours)					
Prerequisites: [WTW114 or WTW101] and [WTW123] and [WTW128 or WTW102]					
WTW285	DISCRETE STRUCTURES 285				
NAS_WTW	n a	Double	2 + 1	S2	12
Counting techniques: combinations with repetition, functions. Pigeot-hole principle. Countability and computability. Setting up and solving recurrence relations. Graphs: paths, cycles, trees, isomorphism. Graph algorithms: Kruskal, Prim, Fleury, loop invariants. (2 lectures and 1 tutorial of 1½ hours)					
Prerequisite: [WTW115]					
WTW286	DIFFERENTIAL EQUATIONS 286				
NAS_WTW	n a	English	2 + 1	S2	12
Theory and solution methods for linear differential equations as well as for systems of linear differential equations. Solution methods for first order non-linear differential equations. The Laplace transform. Introduction to qualitative analysis of linear and non-linear systems. (2 lectures and 1 tutorial of 1½ hours)					
Prerequisites: [WTW114 or WTW101] and [WTW126 or WTW102] and [WTW128 or WTW102]					
WTW310	ANALYSIS 310				
NAS_WTW	n a	Bilingual	2 + 1	S1	18
Topology of finite dimensional spaces: Open and closed sets, compactness, connectedness and completeness. Theorems of Bolzano-Weierstrass and Heine-Borel. Properties of continuous functions and applications. Integration theory in \mathbb{R}^1 and \mathbb{R}^p . Sequences of functions. (2 lectures and 1 tutorial of 1½ hours)					
Prerequisite: [WTW220]					
WTW320	ANALYSIS 320				
NAS_WTW	n a	Bilingual	2 + 1	S2	18
Series of functions, power series and Fourier series. Complex functions, Cauchy-Riemann equations, Cauchy's theorem and integral formulas. Laurent series, residue theorem and calculation of real integrals using residues. (2 lectures and 1 tutorial of 1½ hours)					
Prerequisite: [WTW310]					
WTW332	STOCHASTIC PROCESSES 332				
NAS_WTW	n a	English	2 + 1	S1	18
Mathematical formulations of a number of probability models, properties of random variables, theory of Poisson and Markov processes with applications in Mathematics of Finance and Engineering. (2 lectures and 1 tutorial of 1½ hours)					
Prerequisites: [WTW126 or WTW102] and [WTW218]					
WTW354	FINANCIAL ENGINEERING 354				
NAS_WTW	WTW352	English	2 + 1	S1	18
Mean variance portfolio theory. The capital asset pricing model, factor models. Utility functions. (2 lectures and 1 tutorial of 1½ hours) Prerequisites: [WTW218] and [WTW221]					
WTW364	FINANCIAL ENGINEERING 364				
NAS_WTW	n a	English	2 + 1	S2	18
Discrete time financial models: Arbitrage and hedging; the binomial model. Continuous time financial models: The Black-Scholes formula; pricing of options and the other derivatives; interest rate models; numerical procedures. (2 lectures and 1 tutorial of 1½ hours)					
Prerequisites: [WTW218] and [WTW221]					

WTW381	ALGEBRA 381				
NAS_WTW	n a	Bilingual	2 + 1	S1	18
Group theory: Definition, examples, elementary properties, subgroups, permutation groups, isomorphism, order, cyclic groups, homomorphisms, factor groups. Ring theory: Definition, examples, elementary properties, ideals, homomorphisms, factor rings, polynomial rings, factorisation of polynomials. Field extensions, applications to straight-edge and compass constructions. (2 lectures and 1 tutorial of 1½ hours)					
Prerequisites: [WTW114 or WTW101] and [WTW211]					
WTW382	DYNAMICAL SYSTEMS 382 (from 2003)				
NAS_WTW	n a	Bilingual	2 + 1	S1	18
Matrix exponential function: Homogeneous and non-homogeneous linear systems of partial differential equations. Qualitative analysis of systems: phase portraits, stability, linearisation, energy method and Liapunov's method. Introduction to chaotic systems. Application to real life problems. (2 lectures and 1 tutorial of 1½ hours)					
Prerequisites: [WTW220] and [WTW286]					
WTW383	NUMERICAL ANALYSIS 383				
NAS_WTW	n a	Bilingual	2 + 1	S2	18
Direct methods and iterative methods for the solving of linear equations, pivoting, eigenvalues and eigenvectors. Application in boundary value problems and eigenvalue problems for differential equations. Algorithms for numerical techniques are derived and implemented in computer programs. Complexity of computation is investigated. Error estimates and convergence results are proved. (2 lectures and 1 tutorial of 1½ hours)					
Prerequisites: [WTW114 or WTW101] and [WTW128 or WTW102] and [WTW211]					
WTW385	DISCRETE STRUCTURES 385				
NAS_WTW	n a	Bilingual	2 + 1	S2	18
Basic combinatorial objects: Selections, arrangements, permutations, partitions. Algorithmic generation of combinatorial objects. Generating functions, group actions, Polya theory. (2 lectures and 1 tutorial of 1½ hours)					
Prerequisites: [WTW126 or WTW102] and [WTW218] and [WTW285]					
WTW386	PARTIAL DIFFERENTIAL EQUATIONS 386				
NAS_WTW	n a	Bilingual	2 + 1	S1	18
Conservation laws and modelling. Fourier analysis. Heat equation, wave equation and Laplace's equation. Solution methods including Fourier series. Energy and other qualitative methods. (2 lectures and 1 tutorial of 1½ hours)					
Prerequisites: [WTW218] and [WTW286]					
WTW389	GEOMETRY 389				
NAS_WTW	n a	Bilingual	2 + 1	S2	18
Elementary Euclidean geometry. Axiomatic development. The parallel postulate and non-Euclidean geometry. Orthogonal circles and inversion in circles. Cross ratio, harmonic division and perspectivities. Models of different geometries. (2 lectures and 1 tutorial of 1½ hours) requisite: [WTW211]					
ZEN161	ANIMAL DIVERSITY 161				
NAS_ZEN	ZEN122	Double	4 + 1	K3	8
Animal classification, phylogeny, organization and terminology. Characteristics of the various animal phyla, morphological characteristics and life cycles of parasitic and non-parasitic animals. Basic descriptions of reproductive, respiratory, excretory, circulatory and osmoregulatory systems.					
ZEN251	INVERTEBRATE BIOLOGY 251				
NAS_ZEN	n a	English	4 + 1	K1	12
Origin and extent of modern invertebrate diversity; parasites of man and domestic animals; biology and medical importance of arachnids; insect life styles; the influence of					

the environment on insect life histories; insect phytophagy, predation and parasitism; insect chemical, visual, and auditory communication; freshwater invertebrates and their use as biological indicators.					
ZEN261	AFRICAN VERTEBRATES 261				
NAS_ZEN	n a	English	4 + 2	K3	12
Introduction to biodiversity and the defining of Southern Africa's biomes; characteristic and endemic vertebrate taxa; critical conservation problems; vertebrate case studies; vertebrate development, classification of vertebrates, introduction to the vertebrate skeleton, evolutionary patterns; vertebrate structural adaptation and habit and interactions.					
ZEN351	POPULATION ECOLOGY 351				
NAS_ZEN	n a	English	4 + 2	K1	18
Scientific approach to ecology; evolution and ecology; the individual and its environment; population characteristics and demography; competition; predation; plant-herbivore interactions; regulation of populations; population manipulation.					
ZEN352	MAMMALOLOGY 352				
NAS_ZEN	n a	English	4 + 2	K1	18
Mammalian origins and their characteristics: evolution of african mammals; structure and function: integument, support and movement; foods and feeding; environmental adaptations; reproduction; behaviour, ecology and biogeography, social behaviour; parental care, and mating systems; community ecology; zoogeography; special topics: parasites and diseases, domestication and domesticated mammals, conservation.					
ZEN353	COMMUNITY ECOLOGY 353				
NAS_ZEN	n a	English	4 + 2	K2	18
The scientific approach; characteristics of the community; the community as a super organism; community changes; competition as a factor determining community structure; disturbance as a determinant of community structure; community stability; macro-ecological patterns and mechanisms.					
ZEN354	PHYSIOLOGY 354				
NAS_ZEN	n a	English	4 + 2	K2	18
Background to physiology and the concept of homeostasis, Donnan equilibrium, passive and active transport across semi-permeable membranes. Enzymes and their properties, blood and immunity, the typical nerve cell and associated structures, the resting potential and action potential and conductance along the nerve of an electrical impulse, synaptic transmission between cells, sensory receptors, the neuromuscular junction and muscle contraction, the mammalian heart and haemodynamics, osmoregulation and kidney function, malpighian tubules, lung structure, tracheal system and gaseous exchange, mammalian reproduction, energy, metabolism and thermoregulation, endocrinology – chemical messengers, digestion: exocrine and endocrine secretions and absorption.					
ZEN355	INSECT DIVERSITY 355				
NAS_ZEN	n a	English	4 + 2	K2	18
The extent and significance of insect diversity. Functional insect morphology. The basic principles of taxonomy and the classification of taxa within the Insecta. Insect orders and economically and ecologically important Southern African insect families. Identification of insect orders and families using distinguishing characteristics. General biological and behavioural characteristics of each group. Grouping of insects into similar life-styles and habitats.					
ZEN361	ECO-PHYSIOLOGY 361				
NAS_ZEN	n a	English	4 + 2	K3	18
The relationship between climate and animal geographic distributions; the costs of living; limitations to the acquisition of energy and nutrients; the principles of nutritional ecology; the effects of temperature on whole organism processes and the response of species to					

temperature variation; ectothermic and endothermic temperature regulation; animal responses to high and low temperatures; water balance in terrestrial animals; osmoregulation in different environments; the importance of physiological ecology for understanding geographic variation in body size, range size, and abundance.					
ZEN362	EVOLUTION AND PHYLOGENY 362				
NAS_ZEN	n a	English	4 + 2	K3	18
Evolution as a process and pattern, prime movers in evolution, selection, drift, general population genetics. Population differentiation, clines, subspecies and species, adaptation as a major force in evolution and the panglossian paradigm, molecular evolution. Phylogeography, phylogenetic reconstruction. Evolutionary biogeography. Adaptation, Darwin's formulation, proximate and ultimate causation, genetic and developmental constraints, optimality. Phenotypic models, the comparative method, convergent evolution. Evolution of complex biological systems, origin of life and sex, macro-evolution, punctuated equilibrium, human evolution. Levels of selection. Species concepts.					
ZEN363	BEHAVIOURAL ECOLOGY 363				
NAS_ZEN	n a	English	4 + 2	K4	18
History of behavioural ecology, motivation. The biology of animal signals, sensory systems and recognition systems, integration, sexual selection, mate choice, sperm competition, mating systems, sociality, kin selection, group living, co-operative breeding, power struggles, co-operation in social groups, optimisation of time and energy budgets, offspring allocation, evolution of life histories, phylogenetic basis of behavioural analysis, conservation implications of behavioural ecology, human behavioural ecology.					
ZEN364	CONSERVATION ECOLOGY 364				
NAS_ZEN	n a	English	4 + 2	K4	18
Introductory principles, conservation principles and ethics, what is biodiversity?, global biodiversity patterns, extinction risk, population processes: genetic and demographic processes, problems with small populations, causes of extinction, management to achieve conservation goals, people and parks, sustainable development, achieving conservation goals in an uncertain future.					
ZEN365	INSECT PEST MANAGEMENT 365				
NAS_ZEN	n a	English	4 + 2	K4	18
Definition, classification and characteristics of insect pests. Concepts of economic levels. Monitoring, surveys, sampling and forecasting. Yield loss assessment. Philosophy and context of integrated pest management. Alternative methods of pest control. Insecticide resistance and management. Important pests of South African agricultural crops, gardens and lawns.					

SC 8.2. SYLLABI FOR SCIENCE EDUCATION [BSecEd(Sci)] and [DipEd(Sci)]

(SCE 200) Science Education 200 (2 lectures + 1 practical of 1 hour) (18)

An introduction to patterns of scientific thinking. The growth of scientific thinking and the development of misconceptions in children as a function of age. The infusion of scientific thinking into the science curriculum in a developmentally appropriate way. The Learning Cycle. Principles of curriculum design.

(SCE 300) Science Education 300 (2 lectures + 4 practicals of 1 hour) (42)

Implications of Outcomes Based Education for the science teacher. The design of programme organisers and of learning programmes. Macro planning in the natural science learning area. Provincial and national models of assessment. The assessment

of learner progress in the context of specific science learning programmes. The assessment of learner progress in the context of specific science learning programmes. Introduction to the principles of counselling. Some aspects of school guidance. Career planning and development. Practical experience with learning opportunities arranged by the Centre for Science Education form part of this course.

(SCE 400) Science Education 400 (4 lectures) (44)

Themes in education which provide knowledge, skills and values of a teacher able to promote a culture of learning. Conceptual change strategies, scaffolding, activity theory, discovery learning, peer-group learning. Curriculum examples. The reflective practitioner. Learners with special needs. The educator and societal problems.

(SCE 301) Educational Community Project 301 (28)

Students must demonstrate the ability to facilitate learning with particular emphasis on the application of team teaching, negotiation for resources, planning and implementation. Evaluation includes a dissertation by the student teacher, evaluation reports from a supervisor and participants. Additionally, the student teacher presents a report to peers in the form of a seminar. This contributes two weeks to Teaching Practice. The project is arranged in cooperation with the Centre for Science Education.

(SCE 302) Teaching Practice 302 (Project) (62)

Teaching practice will be in the format of a continuous period of 11 weeks in a functioning school. Support materials demonstrate the possibilities and restrictions of educational technology and provide additional information to stimulate reflection, the cultivation of independent lifelong learning and challenging creativity and thinking skills. Final assessment of competence is based on a portfolio of artefacts and records of proof of the ability of student teachers to facilitate learning, and reasoned arguments to motivate their assessment of their competencies to facilitate learning.

(SCE 402) Teaching Practice 402 (Project) (28)

Teaching Practice will be in the form of an action research project in a functioning school over a continuous period of five weeks. The aim of the research is to analyze and evaluate the promotion of a culture of learning on the macro, meso and micro level in order to improve current practice. Essay and seminar.

(SCE 170) Religious Education 170 (1 lecture) (6)

Prominent Religions in South Africa, world views associated with these religions, the cultural role of religions, importance of holy days. Mysticism and the occult.

SUBJECT DIDACTICS

Subject Didactics are presented in cooperation with relevant departments.

(SCE 471) Subject Didactics of Biology 471 (2 lectures + 1 practical) (36)

Nature and structure of the subject. Learning theory and strategies, whole class, group and individual learning. Methods to encourage independent study and a critical reasoning capacity in pupils. Remediation. Interpreting syllabi, negotiation and setting of objectives, evaluation, assessment and reflection. Identification and interpretation of resource materials. Administration and keeping of records, planning and arranging the practical and laboratory-based learning experience. Environmental issues related to the subject. Career guidance. Laboratory safety and first aid.

Practical: Model school to the equivalent of one week of teaching practice to be arranged in co-operation with the Centre for Science Education.

(SCE 472) Subject Didactics of Geography 472 (2 lectures + 1 practical) (36)

Nature and structure of the subject. Learning theory and strategies, whole class, group and individual learning. Methods to encourage independent study and a critical reasoning capacity in pupils. Remediation. Interpreting syllabi, negotiation and setting of objectives, evaluation, assessment and reflection. Identification and interpretation of resource materials. Administration and keeping of records, planning and arranging the practical and laboratory-based learning experience. Environmental issues related to the subject. Career guidance.

Practical: Model school to the equivalent of one week of teaching practice to be arranged in co-operation with the Centre for Science Education.

(SCE 473) Subject Didactics of Agricultural Science 473 (2 lectures + 1 practical) (36)

Nature and structure of the subject. Learning theory and strategies, whole class, group and individual learning. Methods to encourage independent study and a critical reasoning capacity in pupils. Remediation. Interpreting syllabi, negotiation and setting of objectives, evaluation, assessment and reflection. Identification and interpretation of resource materials. Administration and keeping of records, planning and arranging the practical and laboratory-based learning experience. Environmental issues related to the subject. Career guidance. Laboratory safety and first aid.

Practical: Model school to the equivalent of one week of teaching practice to be arranged in co-operation with the Centre for Science Education.

(SCE 474) Subject Didactics of Physical Science 474 (2 lectures + 1 practical) (36)

Nature and structure of the subject. Learning theory and strategies, whole class, group and individual learning. Methods to encourage independent study and a critical reasoning capacity in pupils. Remediation. Interpreting syllabi, negotiation and setting of objectives, evaluation, assessment and reflection. Identification and interpretation of resource materials. Administration and keeping of records, planning and arranging the practical and laboratory-based learning experience. Environmental issues related to the subject. Career guidance. Laboratory safety and first aid.

Practical: Model school to the equivalent of one week of teaching practice to be arranged in co-operation with the Centre for Science Education.

(SCE 475) Subject Didactics of Computer Studies 475 (2 lectures + 1 practical) (36)

Nature and structure of the subject. Learning theory and strategies, whole class, group and individual learning. Methods to encourage independent study and a critical reasoning capacity in pupils. Remediation. Interpreting syllabi, negotiation and setting of objectives, evaluation, assessment and reflection. Identification and interpretation of resource materials. Administration and keeping of records, planning and arranging the practical and laboratory-based learning experience. Environmental issues related to the subject. Career guidance.

Practical: Model school to the equivalent of one week of teaching practice to be arranged in co-operation with the Centre for Science Education.

(SCE 476) Subject Didactics of Mathematics 476 (2 lectures + 1 practical) (36)

Nature and structure of the subject. Learning theory and strategies, whole class, group and individual learning. Methods to encourage independent study and a critical reasoning capacity in pupils. Remediation. Interpreting syllabi, negotiation and setting of objectives, evaluation, assessment and reflection. Identification and interpretation of resource materials. Administration and keeping of records, planning and arranging the practical

and laboratory-based learning experience. Environmental issues related to the subject. Career guidance.

Practical: Model school to the equivalent of one week of teaching practice to be arranged in co-operation with the Centre for Science Education.

Sc.9 SYLLABI FOR DIPLOMAS

Sc.9.1 FURTHER DIPLOMA IN EDUCATION

SEF 471 Mathematics 471 (28 lectures, 24 h p, 28 hrs of assignments)(16, level 5)

Content

Basic Calculus with applications in single-variable systems. Matrices. Discrete and Continuous Probability.

Outcomes

The learner must demonstrate the achievement of the following outcomes:

- Display knowledge of the underlying structure of mathematics and demonstrate the skill to apply this to several situations encountered in the sciences.
- Demonstrate the ability to perform the necessary and relevant manipulations underlying and derived from the fields of algebra, analysis and calculus.
- Demonstrate the ability to apply probabilistic thought to problems in mathematics and the sciences.
- Demonstrate the ability to employ critical and creative thinking in situations of mathematical, scientific and technological nature, in social and economic contexts.

SEF 472 First Course in Chemistry 472 (28 lectures, 24 h p, 28 hrs of assignments) (16, level 5)

Content

General introduction to atoms, elements, chemical bonding and structure, chemical reactions, reactivity, chemical equilibrium, acids and bases, thermochemistry, electrochemistry, phases of matter, organic bonding, stereochemical aspects, organic reactions of hydrocarbon, alcohols, ethers, thiols, amines, aldehydes, ketones, carboxylic acids and their derivatives, carbohydrates, lipids and proteins.

Practical: Synthesis and properties of simple organic and inorganic compounds.

Outcomes

The learner must demonstrate the achievement of the following outcomes:

- Use of the principles, rules, conventions, theories and models according to which chemical compounds and their structure are described.
- Apply basic principles to balancing of equations and calculations.
- Apply the principles of Organic Chemistry.
- Apply the principles of Biochemistry to describe and explain simple biochemical processes.
- Perform simple chemical experiments successfully, with correct and safe handling of laboratory equipment.
- Communicate effectively in the accepted idiom of the subject Chemistry.
- Problem-solving skills and innovation.

SEF 473 General Physics 473 (28 lectures, 24 h p, 28 hrs of assignments)(16, level 5)

Content

Units, vectors, one-dimensional kinematics of a point, relativistic kinematics, dynamics, equilibrium, sound, liquids, heat, electrical potential and capacitance, optics, radioactivity.

Outcomes

The learner must demonstrate the achievement of the following outcomes:

- Apply the fundamental concepts and principles of the relevant areas of physics to the solution of typical problems of the field.
- Demonstrate the use of measuring instrumentation, perform a critical analysis of the results and report them in an appropriate scientific format.
- Problem-solving skills and innovation

SEF 474 Earth Sciences 474 (28 lectures, 24 h p, 28 hrs of assignments)(32, level 6)

Content

Geology and its subsections: the earth as part of the universe; geological time, the development of the theory of plate tectonics; the chemical composition of the earth. External geological processes; the land surface system; the geological work of gravity, running and subsurface water, wind, ice, lakes, and the sea; stratigraphical synthesis. Earthquakes and magmatic activity. Introduction to economic geology. Physical processes that affect the earth's surface and their management. Specific processes and their interaction in themes such as weathering, soil erosion, slope, mass movement and fluvial processes.

Outcomes

The learner must demonstrate the achievement of the following outcomes:

- Use process skills to investigate the phenomena associated with the physical environment.
- Solve problems in innovative ways, including holistic problems of environmental management and decision making.
- Demonstrate an understanding of the economic, socio-political impacts of the earth sciences and mineral resources in South Africa.
- Demonstrate an understanding of sustainable development of the environment.

SEF 475 Mathematics 475 (28 lectures, 24 h p, 28 hrs of assignments)(32, level 6)

Content

Propositional logic: Syntax, semantics (tautologies), inference rules. Induction and recursion: Relation between induction and recursion; application of induction to loop invariants. Obtaining data and sample techniques. Frequency tables and graphical representation. Descriptive measures of location and spread. Curve fitting, regression and correlation. Theorems on parallelism, loci. Vectors, translation between vector algebra and classical geometry. Congruence and isometric transformations. Similarity and homological transformations. Properties of circles. Special points in triangles. Collinearity and concurrency: theorems of Menelaus and Ceva with applications.

Outcomes

The learner must demonstrate the achievement of the following outcomes:

- Mastery and ability to synthesise statements of formal logic.
- Use the principle of mathematical induction in statements concerning series and sequences of integers.
- Model and analyse algorithms and processes.
- Obtain, analyse and present data using methods and principles of statistics.
- Knowledge and application of principles and theorems of plane geometry of angles, triangles, circles.

SEF 481 Current trends in Mathematics, Science and Technology education 481

(28 lectures, 20hrs of assignments)(16, level 6)

Content

Notions of excellence in Mathematics, Science and Technology education embedded in the learning area programmes will be explored. The philosophy and goals of outcomes-

based education. The specific outcomes in the Natural Sciences, Numeracy and Mathematics, and Technology learning areas. Curriculum development and assessment.

Outcomes

Students must demonstrate the achievement of the following outcomes:

- Display knowledge and evaluate the worth of both international trends and best practice in Mathematics, Science and Technology education and of Mathematics, Science and Technology learning area outcomes of Curriculum 2005.
- Design a curriculum unit based on best practice and selected Curriculum 2005-outcomes, and incorporating previously unused resources.
- Design assessment criteria and instruments for the curriculum unit.
- Test the curriculum unit, including the assessment component, in a classroom setting and evaluate its strengths and weaknesses.

(SEF 482) Computers in Mathematics, Science and Technology education 482

(28 lectures, 20 hours of assignments)(16, level 5)

Content

Basic Internet Skills: The World Wide Web as a source of information and data: Searching the World Wide Web. Searches of cyberspace for programs and data, file transfer protocol and obtaining computer and data files from remote sites; E-mail, distributed messages; news groups and chat areas; finding and using graphics. Newest technology.

Using the Internet in the Mathematics, Science and Technology classroom; taxonomies of the use of telecommunications in the classroom; useful sites on the Internet for mathematics, science and technology teachers; project-based teaching; collaborative projects on the Internet.

Outcomes

Students must demonstrate the achievement of the following outcomes:

- Perform all basic Internet skills listed in the content section above.
- Display knowledge and evaluate the worth of the use of telecommunications in Mathematics, Science and Technology education.
- Design a telecommunications activity that could be used in a Mathematics, Science and Technology curriculum unit based on best practice.
- Test the activity in a classroom setting and evaluate its strengths and weaknesses.

(SEF 483) Computers in Mathematics, Science and Technology education 483

(28 lectures, 20 hours assignments)(24, level 6)

Content

Graphics manipulation, analysis, and visualization. Design curriculum material that can be placed on the Internet.

Outcomes

Students must demonstrate the achievement of the following outcomes:

- Perform all skills related to graphic manipulation, analysis and visualization.
- Display knowledge and evaluate the worth of the use of graphics in Mathematics, Science and Technology education.
- Design an activity based on graphic analysis or visualization that could be used in a Mathematics, Science or Technology curriculum unit based on best practice.
- Test the activity in a classroom setting and evaluate its strengths and weaknesses.
- Design a multimedia presentation as part of the Mathematics, Science or Technology curriculum unit based on best practice.
- Test the presentation in a classroom setting and evaluate its strengths and weaknesses.

(SEF 484) The computer as a laboratory and classroom tool 484 (28 lectures, 20 hours assignments)(32, level 6)

Content

The use of the computer to collect and analyse data that are collected in the laboratory or in the field. Opportunities for the integration of mathematics, science and technology will be explored. Mathematics-, Science- and Technology-oriented software for school use will be demonstrated and evaluated for classroom use and applied appropriately. Software will include: spread sheets, concept formation, simulations and problem solving. Applications of the above at the primary and secondary levels will be provided. The integration of Mathematics, Science and Technology using problem solving approaches will be emphasized.

Outcomes

Students must demonstrate the achievement of the following outcomes:

- Perform all skills related to the use of laboratory interfaces and probes.
- Display knowledge and evaluate the worth of the use of selected software in Mathematics, Science and Technology education.
- Design an activity based on laboratory interfaces and probes that could be used in a Mathematics, Science and Technology curriculum unit based on best practice.
- Test the activity in a classroom setting and evaluate its strengths and weaknesses.
- Design a lesson that incorporates software as part of the Mathematics, Science and Technology curriculum unit based on best practice.
- Test the lesson in a classroom setting and evaluate its strengths and weaknesses.

(SEF 485) Networking software and hardware 485

(28 lectures, 20 hours assignments) (32, level 6)

Content

The setting up of a local area network (LAN) and provision of an Internet Gateway. Various networking options will be explored, and the appropriate software and hardware demonstrated. The role of basic and value-added service providers. Obtaining appropriate services.

Outcomes

Students must demonstrate the achievement of the following outcomes:

- Specify and set up a typical school-based network consisting of a file-server, networked workstations, and a telecommunications link. The set up will include the installation of all relevant software programmes.
- Analyse and solve real or simulated problems on the network.

(RTS 410) Computer-assisted Testing 410 (28 lectures)

Refer to the Regulations and Syllabi of the Faculty of Education.

Development and implementation of computer assisted tests. Management issues associated with computer-assisted testing. Types of questions, feedback and remediation.

POSTGRADUATE STUDIES

Sc.10 HONOURS DEGREES

SC.10.1 BACCALAUREUS SCIENTIAE HONORES [BSc(Hons)]

Also consult General Regulations G.1.3; G. 16, G. 18 and G.62 and postgraduate programmes.

(a) Admission requirements

(i) For the BSc(Hons) degree

Subject to the stipulations of General Reg. G.16, a student is only admitted to the study for the honours degree if he or she holds the BSc or BSc(Ed) degree and provided that he or she complies with the stipulations for the particular courses as set out in the syllabi descriptions.

(ii) The curriculum is compiled in consultation with the head of department, from whom full details may be obtained.

(iii) In cases where the required subject or linguistic basis is lacking, additional courses may be prescribed.

(b) Pass requirements

For more information on the different fields of study, preparation, evaluation and examination of projects, consult the manual of the Faculty, which is obtainable on request from the head of department. The pass mark for essays is at least 50%. The stipulations regarding pass requirements for dissertations in General Regulation G.60.2.1 2(a) apply *mutatis mutandis* to essays.

(c) Degree with distinction

To pass with distinction, a student must obtain an average of at least 75% in the examination as a whole.

(d) Degrees

Disciplines

Actuarial Mathematics

Applied Mathematics

Biochemistry

Biotechnology

Botany

Chemical Sciences: Chemistry

Computer Science

Ecotourism

Engineering and Environmental Geology

Entomology

Exploration Geophysics

Food Science

Genetics

Geography

Geography: Environmental Analysis and

Management

Degree code

02240273

02240171

03241011

02240392

03241091

02240122

02240081

02240374

02240372

03241031

02240351

03240921

03241051

02240411

02240412

Geoinformatics	02240408
Geology	02240141
Mathematical Statistics	02240191
Mathematics of Finance	02240272
Mathematics	02240181
Meteorology	02240070
Microbiology	03240911
Nutrition and Food Sciences	02240373
Physics	02240231
Plant Pathology	03240931
Soil Science	03240901
Teaching of Mathematics	02240271
Wildlife Management	03241001
Zoology	03241021

Sc.10.2 BACCALAUREUS INSTITUTIONIS AGRARIAE HONORES (BInstAgrar(Hons))

Also consult General Regulations G. 16 to G. 29.

(a) Admission requirements

Subject to the stipulations of General Regulations G.1.3 and G.62, a candidate must hold the BInstAgrar degree or an appropriate bachelor's degree to be admitted to the BInstAgrar(Hons). Additional courses, other than the honours courses may be prescribed by the Dean, on the recommendation of the head(s) of the department(s) concerned.

(b) Duration

Training is offered full-time, and in certain fields of specialization also on part-time basis. The course material extends over at least two semesters for full-time students, while the part-time course extends over at least four semesters.

(c) Curriculum

The curriculum consists of a minimum of eight courses, which include the following:

- A common core of three courses, ARD 781, 782 and 783 is compulsory for all fields of specialization, except in the case of the Extension option, for which only ARD 781 and 782 are compulsory. Credit for equivalent courses already passed may be considered, in which case suitable alternative courses will be prescribed by the Dean in consultation with the relevant head of the department concerned.
- The prescribed course work in the student's field of specialization. Credit for equivalent courses already passed may be considered, in which case suitable alternative courses will be prescribed by the Dean in consultation with the head of the department concerned.
- Additional courses required for the particular field of specialization, as stipulated by the Dean in consultation with the head of the department concerned.

(d) Degree with distinction

A student must obtain an average of at least 75 % in the examination(s) of the major course(s), with at least 65 % in all other courses to pass with distinction.

(e) **Degrees**

<u>Discipline</u>	<u>Degree code</u>
Agricultural Economics	03242021
Agronomy	03242184
Animal Production Management	03242187
Crop Protection	03242062
Extension	03242011
Food for Communities and Families	03242188
Food Production and Processing	03242172
Horticulture	03242185
Land Development Planning	03242023
Land Development	03242121
Land-Use Planning	03242051
Pasture Science	03242186
Plant Production	03242031
Plant Protection	03242061
Plant Quarantine	03242183
Rural Development and Ecotourism	03242152
Rural Engineering Technology	03242141
Rural Household Development	03242182
Sustainable Ecological Management	03242131
Sustainable Insect Management	03242101

MASTER'S DEGREES

Sc.11.1 MAGISTER SCIENTIAE (MSc)

Also consult General Regulations G. 1.3, G. 30, G. 32 and G. 62.

(a) **Admission requirements**

- (i) **MSc degree:** Subject to the stipulations of General Regulations G. 1.3, G. 30 and G. 62, an applicable honours degree is a prerequisite for admission. Additional requirements may be set by the Dean on the recommendation of the head of department. A candidate with an average mark of less than 60% for the honours degree will only be admitted to the MSc degree study with the approval of the Dean on the recommendation of the head of department.

(b) **Curriculum**

The MSc degree is conferred by virtue of a dissertation and such additional postgraduate courses as may be prescribed. (Where a BSc(Hons) degree is not a prerequisite for admission to the MSc study, additional postgraduate coursework is compulsory.)

(c) **Pass requirements**

A pass mark of at least 50% must be obtained in both the dissertation and the additional prescribed coursework, if such additional coursework is prescribed.

(d) **Degree with distinction**

The degree is conferred with distinction on a student who obtains a final average of at least 75%, provided that all the members of the Examination Commission

indicate in writing that they have no objection against the degree being conferred with distinction.

(e)	<p>Degrees</p> <p><u>Discipline</u></p> <p>Applied Mathematics</p> <p>Applied Mineralogy</p> <p>Biochemistry</p> <p>Biotechnology</p> <p>Botany</p> <p>Chemistry</p> <p>Computer Science</p> <p>Actuarial Mathematics</p> <p>Conservation Ecology and Planning</p> <p>Earth Science Practice and Management</p> <p>Engineering and Environmental Geology</p> <p>Entomology</p> <p>Environment and Society</p> <p>Environmental Ecology</p> <p>Environmental Economy</p> <p>Environmental Education</p> <p>Exploration Geophysics</p> <p>Food Science and Technology</p> <p>Food Science</p> <p>Genetics</p> <p>Geography</p> <p>Geo-Informatics</p> <p>Geology</p> <p>Integrated Pest and Disease Management</p> <p>Mammology</p> <p>Mathematical Statistics</p> <p>Mathematics Education</p> <p>Mathematics of Finance</p> <p>Mathematics</p> <p>Meteorology</p> <p>Microbiology</p> <p>Physics</p> <p>Plantpathology</p> <p>Post Harvest Technology</p> <p>Science Education</p> <p>Soil Science</p> <p>Systematics and Conservation Evaluation</p> <p>Water Resource Management</p> <p>Wildlife Management</p> <p>Zoology</p>	<p><u>Degree code</u></p> <p>02250171</p> <p>02250381</p> <p>03251011</p> <p>03251052</p> <p>03251091</p> <p>02250121</p> <p>02250081</p> <p>02250395</p> <p>03251028</p> <p>02250072</p> <p>02250372</p> <p>03251031</p> <p>03251032</p> <p>03251033</p> <p>03251034</p> <p>02250443</p> <p>02250431</p> <p>03251110</p> <p>02250444</p> <p>03251051</p> <p>02250411</p> <p>02250412</p> <p>02250141</p> <p>03251024</p> <p>03251027</p> <p>02250191</p> <p>02250183</p> <p>02250182</p> <p>02250181</p> <p>02250070</p> <p>03250911</p> <p>02250231</p> <p>03250881</p> <p>03251102</p> <p>02250442</p> <p>02250393</p> <p>03251026</p> <p>03251035</p> <p>03251001</p> <p>03251021</p>
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Sc.11.2 MAGISTER SCIENTIAE AGRICULTURAE [MSc(Agric)]

Also consult General Regulations G.30 to G.44.

(a) Requirements for admission

Subject to the stipulations of General Regulations G.1.3 and G.62, the BSc(Agric)(Hons) degree with an average of 60% in the final year of the major subject is a requirement for admission to the MSc(Agric) degree. Additional requirements may be stipulated by the head of department.

(b) Duration

Duration of study is at least two years of uninterrupted full-time study (or the part-time equivalent) at this University.

(c) Residence

The Dean may on the recommendation of the head of the department concerned, set particular requirements concerning residence during master's degree studies.

(d) Curricula

The curriculum for the MSc(Agric) degree consists of:

- (i) a dissertation; and further study in the major subject.
- (ii) A total of 240 credits is required for the MSc(Agric) degree, of which 120 are for the dissertation.
- (iii) A student who has been registered for at least two semesters and who has obtained at least half of the credits for the MSc(Agric) degree, including the research project, may apply to have a BSc(Agric)(Hons) degree conferred on him or her *pro forma*.

(e) Examinations and pass requirements

- (i) The final examinations for the MSc(Agric) may only be taken at the end of the second year of study.
- (ii) The examinations in the ancillary courses, if required, must be passed before or concurrent with the examinations in the major subject, unless the Board of the Faculty decides differently.
- (iii) General Regulation G.12.2, as well as paragraph 5 of the Faculty regulations pertaining to examination admission and pass requirements, are applicable to the calculation of marks.
- (iv) A student must pass all prescribed courses as well as the dissertation to obtain the MSc(Agric) degree.
- (v) The degree is conferred with distinction on a student who obtains a final average of at least 75%, provided that all the members of the Examination Commission indicate in writing that they have no objection against the degree being conferred with distinction.

(f) General

Students should take particular note of the maximum period of registration (General Regulation G.32.4), as well as of the requirement regarding submission of a draft article/articles for publication (General Regulation G.61).

(g) Degrees

<u>Discipline</u>	<u>Degree code</u>
Agricultural Economics	03250041
Agronomy	03250454
Animal Science: Production Management	03250441
Animal Science: Animal Breeding and Genetics	03250457
Animal Science: Livestock Nutrition	03250341
Animal Science: Meat Science	03250122
Animal Science: Production Physiology	03250391
Extension	03251030
Food Science and Technology	03250261
Horticulture	03250091
Mechanized Agriculture	03250453
Pasture Science	03250455
Plant Breeding	03250452
Soil Science	03250456

Sc.11.3 MAGISTER INSTITUTIONIS AGRARAE (MInstAgrar)

Also consult General Regulations G. 30 to G. 44.

(a) Admission requirements

Subject to the stipulations of General Requirements G.1.3 and G. 62, a candidate must hold the BInstAgrar, an appropriate four-year degree or an appropriate honours degree for admission to the MInstAgrar degree course. Additional courses may be prescribed by the Dean on the recommendation of the Head of Department. A candidate with an average mark of less than 60 % for the honours degree will only be admitted to MInstAgrar study with the approval of the Dean, on the recommendation of the head of the department.

(b) Curriculum

The curriculum consists of further study in the field of specialization and a dissertation, or alternatively an essay, which encompasses research conducted by the student under supervision of a member of the academic staff.

(c) Degree with distinction

The degree is conferred with distinction on a student who obtains a final average mark of at least 75 %.

(d) General

Students must take particular note of the maximum period of registration (General Regulation G.32.4), as well as of the requirement regarding submission of a draft article/articles for publication (General Regulation G. 61).

(e) Degrees

<u>Discipline</u>	<u>Degree code</u>
Agricultural Economics	03252021
Agronomy	03252072
Animal Production Management	03252093
Crop Protection	03252062
Environmental Management(Taught)	03252132

Extension	03252011
Food Production and Technology	03252112
Horticulture	03252082
Land Development and Ecotourism	03252152
Land Development Planning	03252023
Land Development	03252121
Land-Use Planning	03252051
Pasture Science	03252092
Plant Protection	03252061
Plant Quarantine	03252141
Rural Development Planning	03252023
Rural Engineering Technology	03252191
Rural Household Development (Taught)	03252162
Rural Household Development	03252163
Sustainable Ecological Management	03252131
Sustainable Insect Management	03252101

Sc.11.4 MAGISTER IN CONSUMER SCIENCE(MConsSc)

(a) Admission requirements:

A four-year B Consumer Science or other applicable degree.

(b) Duration:

A minimum of two years full-time and a maximum of four part-time study

(c) Curriculum:

There are two options, each with a total of 240 credits.

(i) Codes 02253002; 02253004; 02253006; 02253008: Dissertation option

Research Methodology 814 (30 credits)

Theoretical Orientation (30 credits)

Electives (2 x 30) (60 credits)

HHK 890 (Dissertation) (120 credits)

(ii) Codes 02253001; 02253003; 02253005; 02253007: Coursework option

Research Methodology 814 (30 credits)

Theoretical Orientation (30 credits)

Electives (4 x 30) (120 credits)

HHK 891 (Script) (60 credits)

To earn credits for the theoretical orientation, two of the following options must be taken:

HSK 810: Social-cultural studies (Cultural orientation) (15 credits)

HSK 812: Social-cultural studies (Cultural orientation) (15 credits)

HSK 813: Social-cultural studies (Development orientation) (15 credits)

HSK 811: Merchandising orientation (15 credits)

Other applicable orientations from outside the Department.

Students choose electives on 800-level from the following three subject groupings:

- Clothing and Textiles
- Foods, Nutrition and Food Service Management
- Interior Merchandising and Consumer Facilitation

Depending on the study, a maximum of two postgraduate subjects may be selected from disciplines from other departments.

Students who already have an honours degree related to one of the chosen areas of study, may apply for exemption of certain subjects.

Depending on the academic background of the student and the chosen area of study, the student may be required to do additional coursework.

Work on the dissertation/script consists of three parts: the research proposal, project execution and an oral presentation of the research.

A basic course in Statistics is compulsory when a quantitative approach is used for a research project.

(d) Prerequisites for the dissertation/script:

The student has to complete and obtain a mark of 60% in NME 814 and Theoretical Orientation before commencement of work on the dissertation/script.

The Department can be consulted for more information on electives and their prerequisites.

(e) Degrees

<u>Discipline</u>	<u>Degree code</u>
Interior Merchandise Management	02253004
Interior Merchandise Management (Taught)	02253003
Clothing Management	02253006
Clothing Management (Taught)	02253005
Development	02253002
Development (Taught)	02253001
Food Management	02253008
Food Management (Taught)	02253007

DOCTORATES

Sc.12 PHILOSOPHIAE DOCTOR: (PhD)

Also consult General Regulations G. 45 to G. 55.

(a) Admission requirements

(i) PhD degree

Subject to the stipulations of General Regulations G.1.3, G.45 and G.62, no student will be admitted to the study for a doctor's degree unless he or she holds a master's degree or has been admitted to the status thereof. Further requirements for admission, if any, are set out in the syllabi of the various Departments.

(ii) PhD in Consumer Science (02263001, 02263002, 02263003, 02263004)

M Consumer Science or applicable Masters degree with a pass mark of at least 60%.

To proceed with the thesis, a student should have fulfilled the requirements for the Masters degree regarding

- Theoretical Orientation
- Research Methodology (NME 814)
- The student should also have published at least one article in a research journal during the two years prior to registration for the PhD

degree or have proof that one has been accepted for publication in a refereed journal.

Furthermore, it should also be evident from the masters thesis or publications that research can be undertaken independently.

NB: The student may be required to do additional coursework.

(b) Duration:

A minimum of two years full-time study

(c) Residence

Doctoral students may be required to reside at the University for further study on the recommendation of the head of department and with the approval of the Dean. Unless the Dean decided otherwise, this period must be devoted to full-time study.

(d) Curriculum

The curriculum for the PhD degree consists of:

- (i) theoretical knowledge of the major subject and such ancillary courses as may be required; and
- (ii) a thesis.

(e) Conferring of degree

- (i) A PhD student must submit a thesis which deals with a topic from the list of subject disciplines.
- (ii) The doctoral examination, either written and/or oral, is compulsory and covers the content of the thesis as well as the divisions of the field of study on which the thesis is based.

(f) General

Students must take particular note of the maximum period of registration (General Regulation G. 47), as well as of the requirements regarding the submission of a draft article/articles for publication (General Regulation G. 61).

(g) Degrees

<u>Discipline</u>	<u>Degree code</u>
Agrarian Extension	03262002
Agricultural Economics	03260042
Agronomy	03262164
Animal Production Management	02260545
Animal Science	03261041
Biochemistry	03260012
Biotechnology	03262162
Botany	03261091
Chemistry	02260451
Computer Science	02260591
Consumer Science: Development	02263003
Consumer Science: Food Management	02263004
Consumer Science: Interior Merchandise Management	02263001
Consumer Science: Clothing Management	02263002
Crop Protection	03262021
Engineering and Environmental Geology	02260542
Entomology	03260121

Environmental Studies	03260127
Exploration Geophysics	02260531
Food Science	02260546
Genetics	03260292
Geography	02260511
Geo-Informatics	02260512
Geology	02260521
Horticulture	02260544
Land Development	03262121
Land-Use Planning	03262012
Mathematical Science	02260761
Mechanized Agriculture	03262163
Meteorology	02260630
Microbiology	03260072
Pasture Science	03262165
Physics	02260481
Plant Breeding	02260543
Plant Pathology	03260302
Plant Protection	03262151
Plant Quarantine	03262141
Rural Development and Ecotourism	03262152
Rural Development Planning	03262023
Rural Engineering Technology	03262191
Science Education	02260752
Soil Science	03262166
Sustainable Ecological Management	03262131
Sustainable Insect Management	03262132
Wildlife Management	03261001
Zoology	03261021

Sc.13 DOCTOR SCIENTIAE: DSc (Code 03260001)
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Consult General Regulation G.56.

This degree usually follows on the PhD degree and is conferred by virtue of publications emanating from independent research. The publication must represent a meaningful contribution to a specific sub-discipline.

(a) Guidelines for evaluation

(i) Disciplines

The DSc degree in the Faculty of Natural and Agricultural Sciences is conferred by virtue of published research work in one of the disciplines in the faculty.

(ii) Criteria

The work submitted for the DSc must constitute an original and important contribution to scientific knowledge and insight in that it is

- regarded as a substantial and coherent contribution to the advancement of the frontiers of knowledge and insight into the specific sub-discipline, and
- proof of the candidate's achievement with regards to international leadership in the specific field of scientific research.

The emphasis in the assessment of the work of a DSc candidate must be placed on originality, substance and excellence.

(iii) **Presentation**

The document submitted for examination must consist of a selection of published articles as well as a motivated representation in which the grounds for submission and coherency of the work presented is evident.

MEDALS AND PRIZES AWARDED IN THE FACULTY

Name	Donor	Award
Meiring Naudé Medal	Dr SM Naude	For the best student who obtained at least 75 % in all the theoretical and practical courses for the BSc(Hons) with specialization in Physics.
Sentrachem Book Prizes	Sentrachem (Pty) Ltd	1. Best achievement in Chemistry at 300 level. 2. Best achievement in Chemistry at BSc(Hons) level.
Merck Prize	Merk(Pty) Ltd	Best achievement in Chemistry at 300 level.
Sasol Prize	Sasol Ltd	1. Best achievement in Chemistry 152, 153 and 161, 162, on condition that the student continues studies in Chemistry. 2. Best achievement in Chemistry at 200 level, on condition that the student continues studies in Chemistry. 3. Best achievement in Chemistry at 300 level. 4. Best achievement in Chemistry At BSc(Hons) level.
Department of Chemistry Prize		1. Best achievement in Chemistry 152, 153 and 161, 162. 2. Best achievement in Chemistry at 200 level.
Department of Physics Prize	Department of Physics, UP	1. Best achievement in Physics at first-year level. 2. Best achievement in Physics at second-year level. 3. Best achievement in Physics at third-year level 5. Best achievement in Physics at BSc(Hons) level.
Dewald Hattingh Book Prize	Mrs ASJ Hattingh	For the best third-year student in Mathematics.
Lecturers' Prize in Geography	Department of Geography	To a third year student who obtained the highest average marks in Geography over the three years of undergraduate study
Jan F Celliers Bursary	Dr IB Celliers	To a student in the first, second and third year, who takes Geology as main subject – according to academic achievement and financial need. 1. Student at 100 level who achieves 88 credits concurrently with an average of 60%.

Name	Donor	Award
		2. Student at 200 level who achieves 144 credits concurrently, of which 72 in Geology, with an average of 60%. 3. Student at 300 level who obtains 144 credits concurrently, of which at least 90 in Geology, Exploration Physics or Engineering Geology, with an average of 60%, and on condition that the student continues the studies in Geology.
Johan and Sophie van Heerden Floating Trophy	Johan and Sophie van Heerden	A student who achieves the highest average mark for Meteorology courses at second and third-year level and who passes the third -year courses in a period of one year.
Pierre du Plessis Prize	A group of friends and family of the late Pierre du Plessis	Student in Physics at 300 level, on condition that the student passes with distinction.
GENSEC Prize	GENSEC	Most outstanding honours student in Financial Mathematics.
SA Mathematics Society Bronze Medal	SA Mathematics Society	Best honours student in Mathematics or Applied Mathematics.
ISIS Software Engineering Prize	ISIS	Best BSc(IT) group project in Software Engineering
Microsoft Third Year Computer Science Prize	Microsoft	Best BSc(IT) female student in third year
Microsoft Year Operating System Prize	Microsoft	Best BSc(IT) student in Operating Systems
Microsoft First Year Computer Science Prize	Microsoft	Best BSc(IT) student in first year
Saambou Bank Prize	Saambou Bank	Best achievement at honours level in Geography.
Johan J Theron Trophy	Prof Johan J Theron	The best BSc student with Human Physiology as a major subject (average of second and third-year courses)
Junior Captain Scott Commemorative Medal	South African Biological Society	To the student who submits the best MSc dissertation in a biological field and on a subject to be determined by the donor
AEASA Prize	Agricultural Economics Association of South Africa	To the best undergraduate student in Agricultural Economics, BSc(Agric), or BCom, who achieves an average mark of at least 70% in Agricultural Economics throughout the years of study

Name	Donor	Award
Margaretha Mes Medal	Botany Department	For the best BSc(Hons) student who obtains the degree with a pass mark of at least 65% and whose essay is based on an aspect of Plant Physiology
Merck Merit Award for Biochemistry (Hons)	Merck Chemicals (South Africa)	To the best student who obtains the Honours degree in Biochemistry with distinction
SAAB Junior Medal for Botany	South African Association for Botany	For the best doctoral thesis submitted at a South African university by a person not older than 35 years
Schweickerdt Medal for Botany	The late Prof HGWJ Schweickerdt	To the best BSc(Hons) student who obtained the degree with a pass mark of at least 65% and whose essay is based on an aspect of Botany other than Plant Physiology
ZSSA Prize for Zoology	Zoological Society of Southern Africa	To the Honours student who obtains the BSc(Hons) degree with the highest average mark, with the proviso that the degree is awarded with distinction
Zoological Society of Southern Africa Prize	Zoological Society of Southern Africa	To the best student in Zoology at 300 level
Genetics Honours Achievement Award	Genetics Department	To the best Honours student in Genetics
SA Genetics Society Hofmeyer-Van Schaik Prize	South African Genetics Society	To the best BSc(Agric) or BSc(Hons) student in the fourth year of study who achieves a final mark of at least 75% in Genetics
Margaretha Mes Commemorative Prize	South African Association of University Women (Pretoria branch)	To the best female student in Botany at the 300 level
AM Bosman Medal	Farmers' Weekly	To the most deserving postgraduate student in Animal Science
HB Davel Medal	Farmers' Weekly	To the student who completes the BSc(Agric) degree most successfully
Medal of the South African Society of Crop Production	South African Society of Crop Production	To the best BSc(Agric) student in Crop Production
Dr and Mrs Geyer Floating Trophy	Dr and Mrs J W Geyer	Awarded to a student in the Faculty of Biology and Agricultural Sciences for academic excellence as well as other achievements

Name	Donor	Award
Novartis Prize	Novartis	To the best student in Plant Pathology in the final year of the BSc, BSc(Agric) or BInstAgrar degree course
Capespan Prize	Capespan International	To the best student in Plant Pathology or Microbiology in the final year of the BSc(Agric) or BSc degree
J J Veenstra Floating Trophy	Mr J J Veenstra	To the Animal Science student who displays the most zeal in both the theoretical as well as the practical training of the degree
SAAFoSt Academic Merit Award	South African Association for Food Science and Technology	To the most outstanding student in the final year of the BSc(Agric) degree with specialization in Food Science
SASAS Prize	South African Society of Animal Science	To the most outstanding undergraduate in Animal Science
SASAS Transvaal Branch Award	South African Society of Animal Science	To the most outstanding student in the third year of study in Animal Science
Koos van der Merwe/ AFMA Prize	Animal Feed and Manufacture Association	To a student in the final year of study for the best achievement in Animal Nutrition at any South African university
SASAS Prize	South African Society of Animal Science	To the most outstanding postgraduate student(s) in Animal Science at Master's and Doctoral level at any South African university
SAPBA Prize	South African Plant Breeders Association	To the best final-year student in Plant Breeding
SASDT Meritorious Award	South African Society of Dairy Technology	To a student in the department of Food Science who achieves outstanding academic results, and who displays exceptional enthusiasm for the dairy component of the syllabus
Omnia Fertilizer Award	Omnia Fertilizer Incorporated	To the best final-year student in Plant Production and Soil Science
Richards Bay Minerals Junior Prestige Award	Richards Bay Minerals	For best honours student in Zoology
Richards Bay Minerals Senior Prestige Award	Richards Bay Minerals	For best achievement in Zoology at master's level
Richards Bay Minerals Senior Prestige Award	Richards Bay Minerals	For best achievement in Zoology at doctoral level
Rüsch and Van Biljon Prize	Pieter Rüsch and Gert van Biljon	For the final-year project by a B Eng or BSc(Agric) student which shows the best economic potential
Medal: Vice Chancellor and Principal	UP	Best achievement in all the undergraduate study years in any scientific field at the University of Pretoria

Name	Donor	Award
Department Home Economics		
Anniqve Theron Achievement Prize	Anniqve Theron	Top achiever in Home Economics General
Husqvarna Achievement Prize	Nordic Sewing Machines	Best achievement in VLG 310, 320 concurrently.
Bernina Achievement Prize	Bernina Saskor, JHB	Achievement in Garment Construction 310 (Theory and Practice).
Bernina Achievement Prize	Bernina Saskor, JHB	Best achievement in Garment Construction 310 (practice).
Bernina Achievement Prize	Bernina Saskor, JHB	Best achievement in Clothing Construction 310 (design and creativity).
Benjamin Woollens Achievement Prize	Benjamin Woollens	Top achiever in Clothing Construction 310 (theory and practice).
Rees Mann Achievement Prize	Mannettes, JHB	Best student in the commercial production component of Clothing Construction 310.
Award in Agrarian Extension		
Bronze Medal of Honour from the SA Society for Agricultural Extension	South African Society for Agricultural Extension	To the best honours student in Agricultural Extension
Wildlife Management		
Van Schaik Prize in Wildlife Management	J L van Schaik Publishers	For the best achievement by a BSc(Hons) student in the final examination with specialization in Wildlife Management
Welder Wildlife Foundation Texas Merit Award	Centre for Wildlife Research	To the best BSc(Hons) student with specialization in Wildlife Management who achieved a final mark of at least 70%
Not limited to the Faculty of Science		
SRC Honorary Medal	Student Representative Council	Student who delivered the best service to the community.
S ₂ A ₃ Bronze Medal	South African Society for the advancement of science (donor: Sentrachem Ltd)	To a student who completed an extremely good master's study in the field which is traditionally part of the activities of the South African Society for the Advancement of Science (S ₂ A ₃) members of the Convocation of the University of Pretoria.

The Afrikaans text of this publication is the official version and will be given precedence in the interpretation of the content.