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 module is determined and the department that presents the course.
NAS_BCM	=	Faculty of Natural and Agricultural Sciences_Department of Biochemistry
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 Computer Science
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 Dev elopment
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	= Computer	Faculty of Natural and Agricultural Sciences_Gold Fields 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
VET_PAS	=	Faculty of Veterinary Science_Department of Genetics

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)

Quarter: The quarter 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 module must be taken either before or concurrent with the module 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 modules that appear at the beginning of this publication

Module	**Title**				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**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.					
AGC161	**INTRODUCTORY_AGRICULTURE_161**				
NAS_PGW	AGC152	English	2 + 0.5	S2	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.					
AGR313	**PRIMARY_FOOD_CROPS_313**				
NAS_PGW	AGR351,352	Bilingual	2 + 0.5	S1	14
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.					
AGR361	**INDUSTRIAL_CROPS_361**				
NAS_PGW	AGR323	Bilingual	2 + 0.5	S2	14
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	**PROD.SYST.1:_GRAIN_CROPS_450**				
NAS_PGW	AGR481	English	2 + 0.5	S1	12

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
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	**PROD.SYST.11:_VEGETABLE_CR.460**				
NAS_PGW	AGR482	English	2 + 0.5	S2	12
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 organization.					
AGV412	**GROUP_DYNA.LEADSH.&COM.FAC.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; channels and methods of communication. Effective listening and feedback. Practical training in communication: Effective speaking; visual aids in communication; managing conflict; report writing.					
AGV415	**PRINC.&APPRO.OF_DEVEL.&EXT_415**				
NAS_LEK	n a	English	2 + 0	J1	20
The role, importance and nature of extension and development; ethics in development and extension. International approaches to development and extension; paradigm shifts within extension and development. The Third World: concept, characteristics and change. The subsistence farmer, rural poverty and the deprivation trap. Development practice and 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. Dequarterinants of interpersonal communication. Abating factors impeding communication. Nature, classification and efficiency of communication channels.					
AGV426	**PROGRAMME_&_PROJECT_PLAN.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 conceptualization and development of survey instrument; situation surveys and analyses; formulation of objectives; identification and scheduling of methods and activities; work plan or calendar construction,					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
budgeting.					
AGV428	**EVAL.OF_DEVEL.&DEVEL.PROJS.428**				
NAS_LEK	n a	English	3 + 0	S2	20
Reasons and purposes of evaluation; expectations from evaluations; role players and motives in evaluation. Criteria and indicators of development, development projects and development organizations. 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_&INTERVEN.429**				
NAS_LEK	n a	English	2 + 0	J1	20
Characteristics of human behaviour; basic concepts: perception, defense mechanism, decision making and problem solving, learning, innovativeness and adoption behaviour; diffusion of innovations: elements and phases of diffusion, opinion leaders and contact farmers, methodological implications for extension. Psychological, cultural and social barriers to change. Behaviour change or modification: comparison of different approaches and strategies. A practical model: Background principles and theories, identifying “forces” or behaviour dequarterinants; designing effective extension messages for development programmes.					
AGV481	**EXTENSPHIL_ORGAN_&_MNGEM_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 organizations; personnel management; administration; seminar.					
AGV482	**LEADERSHIP&_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_EXTENS&_DEVELOPM_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_PRORAMMING_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 conceptualization, 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					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
measuring instruments; construction of scales; interviewing; statistical methods; research reporting; computer programming; practical exercises.					
AGV489	**ACCEPTANCE_&_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 dequarterining behaviour, categories of acceptance. Diffusion: clarification of concepts; deficiencies of empirical research; seminar.					
AHG300	**ANIMAL_HANDLING_300**				
GTS_VET_PAS	n a	English	1 + 1	J1	6
Animal contact sessions are compulsory and include hands-on sessions for domestic and farm animals. Students are expected to acquire the skills necessary to handle animals, and know how and why a range of basic animal management is carried out. **Prerequisite:** [Only students selected for BSc(Veterinary Biology)III]					
AKM702	**FINANCIAL_MATHEMATICS_702**				
NAS_VWT	n a	English	2 + 0	S1	24
Generalized 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. Quarter structure of interest rates. Stochastic interest rate models. This module can also be taken in the second semester. **Prerequisite:** [IAS211]					
ANA126	**BASIC_HUMAN_HISTOLOGY_126**				
MED_ANA	n a	Bilingual	1 + 1	S2	12
General introduction to cells and tissue, quarterinology, the cell and cytoplasm, organelles and inclusions, surface and glandular epithelium, general connective tissue, specialized 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. Quarterinology. 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, specialized stains. Principles of the operation of LM and EM: general LM, fluorescent microscopy, differential contrast microscopy, dark field microscopy, phase contrast microscopy, transmission and scanning electron microscopy.					
APS461	**CROP_PHYSIOLOGY_461**				
NAS_PGW	PPK411	English	2 + 0.5	S2	14
Physiology of growth, yield, and quality; effect of environmental factors upon plant carbon budget, source – sink relationships, stress physiology, growth analysis and modeling. Growth manipulation. **Prerequisites:** [GKD250] and [GKD260] and [HSC252] and [HSC261] and [PGW352]					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
APZ221	**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. Mendelic heredity. Gene frequencies. Qualitative hereditary characteristics in livestock. **Prerequisite:** [TDH]					
APZ312	**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. Capita selecta: (A) Monogastric application (2 l.p.w. + ¼ p.), (B) Ruminant application (2 l.p.w. + ¼ p.). **Prerequisite:** [APZ221] or [TDH]					
APZ321	**LIVESTOCK_PRODUCTION_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] or [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]					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
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] or [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] or [TDH]					
ARD480	**AGRIC.&_RURAL_DEVELOP.STUD.480**				
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 the rural economy; 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 decision making 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	**INTRO._TO_PROT._&_ENZYMES_251**				
NAS_BCM	BCM216	Bilingual	2 + 0.5	S1	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 dequarterinations. 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 GS] and [CMY127 GS] and [MLB111 GS]					
BCM252	**CARBOHYDRATE_METABOLISM_252**				
NAS_BCM	BCM217	Bilingual	2 + 0.5	S1	12
Biochemistry of carbohydrates. Thermodynamics and bioenergetics. Glycolysis, citric acid cycle and electron transport. Glycogen metabolism, pentose-phosphate pathway, gluconeogenesis and photosynthesis. **Prerequisites:** [CMY117 GS] and [CMY127 GS] and [MLB111 GS]					
BCM261	**LIPID_&_NITROGEN_METABOLIS.261**				
NAS_BCM	BCM226	Bilingual	2 + 0.5	S2	12
Biochemistry of lipids, membrane structure, anabolism and catabolism of lipids. Nitrogen					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
metabolism, amino acid biosynthesis and catabolism. Biosynthesis of neurotransmitters, pigments, hormones and nucleotides from amino acids. Catabolism of pureness 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 GS] and [CMY127 GS] and [MLB111 GS]					
BCM262	**BIOCHEMISTRY_IN_PERSPECT._262**				
NAS_BCM	BCM227	Bilingual	2 + 0.5	S2	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 GS] and [CMY127 GS] and [MLB111 GS]					
BCM271	**BIOCHEMISTRY_PRACTICAL_271**				
NAS_BCM	BCM228	Bilingual	0 + 1	J1	12
(Note: for students majoring in Biochemistry only) 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	K2	9
Analysis of amino acid composition and sequence of proteins. Isolation and characterization 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 relation investigations. **Prerequisites:** [BCM251] and [BCM351 GS]					
BCM354	**BIOCHEM._OF_NUCLEIC_ACIDS_354**				
NAS_BCM	BCM411	Double	1 + 0.5	S1	9
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. Interaction between nucleic acids and nucleic acids binding proteins. Enzymology of gene manipulation. Principles of the Polymerise Chain Reaction (PCR). Nucleotide sequence dequarterination of nucleic acids. Chemical synthesis and use of oligonucleotides. Note. The practical is shared with the departments of Microbiology and Genetics. **Prerequisites:** [BCM251] and [BCM252] and [BCM261] and [BCM262]					
BCM355	**IMMUNOBIOLOGY_355**				
NAS_BCM	BCM423	Double	1 + 0.5	S1	9
Adaptive and innate immunity. Complement. Organs and cells of the immune response. Cell killing: Phagocytosis, apoptosis and necrosis. Anatomy and ontogeny (development)					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
of the immune system. Chemical and cellular techniques of immunology. The origin of diversity in antigen receptors. Practical: Working with experimental animals, the synthesis of hapten-protein conjugate, immunization, bleeding and serum production and an immuno-assay. **Prerequisites:** [BCM251] and [BCM252] and [BCM261] and [BCM262]					
BCM362	**NUTRITIONAL_BIOCHEMISTRY_362**				
NAS_BCM	BCM413	English	1 + 0	K3	4
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, e.g. growth, exercise, pregnancy and lactation, aging and starvation. Comparison of monogastric and ruminant species. Significance of the composition of the carbohydrates e.g. 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 dequarterination 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	K4	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 defense and animal adaptive responses.					
BCM364	**BUILDING_THE_CELL_364**				
NAS_BCM	BCM322	English	1 + 0.5	S2	9
Membrane structure: plasma membrane structure, organization of lipid membranes, membrane proteins, glycoproteins and glycolipids, principles of membrane organization, 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.					
BCM365	**IMMUNOBIOCHEMISTRY_365**				
NAS_BCM	BCH423	Double	1 + 0.5	S2	9
Synthesis and sorting of plasma membrane, secretry and lysosomal proteins. Interactions between antigens and antibodies: Quantitative and qualitative properties. Control of the immune response. Practical: The synthesis of a happen-protein conjugate, an immuno-assay and tutorials in antibody characterization and control of the immune response. **Prerequisite:** [BCM355 GS]					
BCM366	**ENZYMOLOGY_366**				
NAS_BCM	BCM321	English	1 + 1	S2	9
Nomenclature: enzyme nomenclature and classification. Specificity and mechanisms: the					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
active site, mechanisms of catalysis and examples of specific enzyme mechanisms e.g. 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, dequarterination of pH and temperature optimum, dequarterination of Km and Vmax, enzyme activation, enzyme inhibition, purification table and final report, oral defense of report.					
BDO181	**INDUSTR._&_ORG._PSYCHOLOGY_181**				
EB_BDO	n a	Bilingual	4 + 0	J1	5
Capita selecta: This module will provide an introduction to personnel psychology, organizational 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 utilization and motivation will be discussed both theoretically and practically. Labour relations will be studied in quarter of the institutional processes and service relationship and will include practical aspects such as grievance handling, disciplining and dispute resolution.					
BDO251	**INDUSTR._&_ORG._PSYCHOLOGY_251**				
EB_BDO	n a	Bilingual	3 + 0	K1	8
Group Behaviour and Leadership: This module will focus on organizational behaviour with specific reference to the principles of group behaviour and the role of work teams in the organization. Particular attention will be paid to group development, group interaction, group structures, group processes and the promotion of team performance in the organization. Leadership and the effect of power and politics in the organization will be studied. The function of leadership in individual, group and task oriented behaviour will also be addressed.					
BD252	**INDUSTR._&_ORG._PSYCHOLOGY_252**				
EB_BDO	n a	Bilingual	3 + 0	K2	8
Organizational Behaviour: The behavioural basis for organizational structuring and organization design will be addressed in this module. This will include organizational culture as important facet in any organization. The dynamics and approaches to organizational change will be addressed with specific reference to the role of change agents, resistance to change and organizational development with a practical discussion on contemporary problems related to organizational change.					
BEH311	**HOUSING_311**				
NAS_VBR	BEH361	Bilingual	4 + 0	S1	12
Inter-relationship between man's immediate environment (housing, neighbourhood and home range), his social behaviour and well being from an ecological perspective. Evaluation of different housing types in quarter of functions, health, safety, climate control and durability. Acquiring housing, different types of housing, rent, build, buy, contracts, financing, role players in housing provision in SA, responsibilities of occupants.					
BEM110	**MARKETING_MANAGEMENT_110**				
EB_BEM	n a	Bilingual	3 + 0	S1	10
Fundamentals of marketing management and marketing instruments: 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					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
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
Consumer behaviour: 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).					
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, concession agreements, relationship management and the forming of strategic alliances. **Prerequisite:** [BEM110 GS]					
BEM262	**MARKETING_MANAGEMENT_262**				
EB_BEM	n a	Bilingual	3 + 0	K4	8
Product decisions: Problem supposition and problem dequarterination in connection with product decisions, management strategies of the enterprise, enterprise strategy, product strategy, organization of product strategy, product and market development strategy. Case studies, group discussions, seminars, guest speakers, visit to enterprises for meaningful integration of theory and practice. **Prerequisite:** [BEM110 GS]					
BEM310	**MARKETING_MANAGEMENT_310**				
EB_BEM	n a	Bilingual	3 + 1	S1	20

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
Product decisions: Demarcation and quarterinology with regard to product decisions, management strategy of the enterprise, enterprise strategy, product strategy, organization for product strategy, product and market development strategy. Pricing decisions: Enterprises that are primarily price dequarteriners. Influence of cost demand and competition on the fixing of price dequarteriners 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	S1	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_BIOL.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	**GENERAL_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 disinfections, sterilization and control of microbes; techniques for microbial repression: sterilization by using heat, radiation, filtration, chemicals; decimation of numbers.					
BME120	**BIOMETRY_120**				
NAS_WST	BME161,162	Double	4 + 1	S2	16
Simple statistical analysis: Data collection and analysis: Samples, tabulation, graphical representation, describing location, spread and skewness. Introductory probability and distribution theory. Sampling distributions and the central limit theorem. Statistical					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
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, randomized blocks. *Multiple statistical analysis*: Bivariate data sets: Curve fitting (linear and non-linear), growth curves. 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. 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. **Prerequisites:** [STK113 GS] and [STK113 GS] and [STK123 GS] and [STK123 GS] and [Or at least 40% (HG) or 50% (SG) Grade 12 Mathematics or an equivalent Mathematics achievement.]					
BME210	**BIOMETRY_210**				
NAS_WST	BME251,252	English	4 + 1	S1	24
Analysis of variance: Multiway classification. Testing of model assumptions, graphics. Multiple comparisons. Fixed, stochastic and mixed effect models. Block experiments. Estimation of effects. 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 programmes. Report writing. **Prerequisite:** [BME120]					
BOT161	**PLANT_BIOLOGY_161**				
NAS_BOT	n a	Bilingual	2 + 0.5	S2	8
Basic plant structure; plant organs at work; metamorphic plant organs and their function; introductory plant taxonomy and plant systematic; the ecosystem; adaptation of plants to extreme environments; introduction to veld evaluation and veld management. **Prerequisite:** [MLB111 GS] or [TDH]					
BOT251	**SA_FLORA_&_VEGETATION_251**				
NAS_BOT	n a	Bilingual	2 + 1	S1	12
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. **Prerequisite:** [BOT161] or [TDH]					
BOT261	**PLANT_BIOCHEM._EVOLUTION_261**				
NAS_BOT	n a	Bilingual	2 + 1	S2	12
Role of biochemical evolution in the survival of plants as stationary organisms (coordination of outotrophic and heterotrophic metabolism on cellular and whole plant level, nitrogen fixation, defence mechanisms and interaction with other organisms). 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	Bilingual	2 + 1	S1	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					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
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_&_FUNCTION_352**				
NAS_BOT	n a	Bilingual	2 + 1	S1	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	Bilingual	2 + 1	S1	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_&_EVOLUTION_354**				
NAS_BOT	n a	Bilingual	2 + 1	S1	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	Bilingual	2 + 1	S2	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	Bilingual	2 + 1	S2	18
Principles and practice of plant systematic. 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	Bilingual	2 + 1	S2	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					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
vegetation studies for vegetation management, using case studies. **Prerequisite:** [BOT161] or [TDH]					
CHM215	**CHEMISTRY_215**				
NAS_CMY	n a	Double	3 + 1	S1	16
Organic chemistry. Chemical properties of organic (including aromatic) compounds. Functional group transformation and synthesis. Physical Chemistry. Colloid chemistry. Surface chemistry and processes at solid surfaces. PVT properties of real gases. **Prerequisites:** [CHM171] and [CHM181]					
CHM226	**CHEMISTRY_215**				
NAS_CMY	n a	Double	2 + 1	S2	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: Two lectures per week. Third quarter: Six 3 hour practical.) **Prerequisites:** [CHM171] and [CHM181]					
CIL171	**COMPUTER_&_INFORM.LITERACY_171**				
EB_INF	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_&_INFORM.LITERACY_172**				
EB_INF	n a	Double	2 + 0	K2	3
Word-processing programmes: Creation, editing and formatting of documents, outline editing, automatic numbering and footnotes, tables and columns, insertion of multimedia, data exchanges etc. Presentation programmes: Creation of presentations, together with figures, text animation and the insertion of multimedia.					
CIL173	**COMPUTER_&_INFORM.LITERACY_173**				
EB_INF	n a	Double	2 + 0	K3	3
Spreadsheet programmes: basic spreadsheet skills including formulas and diagrams. Database programmes: Basic database skills including searches, compilation of reports, etc.					
CIL174	**COMPUTER_&_INFORM.LITERACY_174**				
EB_INF	n a	Double	2 + 0	K4	3
Search strategy formulation: the use of Boolean operators, natural language and 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	**FIRST_MODULE_IN_CHEMISTRY_101**				
NAS_CMY	n a	English	4 + 1.5	J1	16
Theory: (Four lectures or contact via the Virtual Campus, Web-CT). General introduction to inorganic and analytical chemistry. Nomenclature of inorganic ions and compounds, stoichiometric calculations concerning various different types of chemical reactions. Atomic structure and periodicity. Molecular structure and chemical bonding using the VSEPR model. Equilibria, acid, bases, buffers and precipitates. Practical and tutorials: One 3 hour practical or tutorial per week.					
CMY102	**GENERAL_CHEMISTRY_102**				

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
NAS_CMY	n a	English	4 + 1.5	J1	16
Theory: General physical-analytical chemistry: Physical behaviour of gases, liquids and solids, inquarterolecular forces, solutions, chemical equilibrium, acids and bases, buffers, precipitation. Descriptive inorganic chemistry: Main group and transition elements. Practical. Organic chemistry: Structure (bonding), nomenclature, isomerism, introductory stereochemistry, introduction to chemical reactions and chemical properties of organic compounds. Practical: 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 every second week.) **Prerequisite:** [CMY101]					
CMY117	**GENERAL_CHEMISTRY_117**				
NAS_CMY	CMY152 and CMY153	Double	4 + 1	S1	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. Theory: Inorganic and physical chemistry. Molecular structure and chemical bonding using the VSEPR models. Principles of reactivity, electrochemistry, energy and chemical reactions, entropy and free energy. Practical: (Note: Four lectures and one 3 hour practical or tutorial per week.) **Prerequisite:** [Par 1.2]					
CMY127	**GENERAL_CHEMISTRY_127**				
NAS_CMY	CMY 161 and CMY162	Double	4 + 1	S2	16
Theory: General physical-analytical chemistry: Physical behaviour of gases, liquids and solids, inquarterolecular forces, solutions, chemical equilibrium, acids and bases, buffers, precipitation. Descriptive inorganic chemistry: Main group and transition elements. Organic chemistry: Structure (bonding), nomenclature, isomerism, introductory stereochemistry introduction to chemical reactions and chemical properties of organic compounds. Organic chemistry: Structure (bonding), nomenclature, isomerism, introductory stereochemistry, introduction to chemical reactions and chemical properties of organic compounds. Practical: Molecular structure (model building session), synthesis and properties of simple organic compounds. (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 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.)					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
Prerequisites: [CMY117 or CMY101 and CMY102] and [CMY127 or CMY101 and CMY102] and [WTW114 GS or WTW134 GS or WTW158 GS]					
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-, neutralization- and complex formation titrations, redox titrations, potensiometric 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, alkyl halides, 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]					
CMY382	**PHYSICAL_CHEMISTRY_382**				
NAS_CMY	n a	English	4 + 1	K4	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.) **Prerequisites:** [CMY282] and [CMY283] and [CMY284] and [CMY285]					
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.) **Prerequisites:** [CMY282] and [CMY283] and [CMY284] and [CMY285]					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
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.) **Prerequisites:** [CMY282] and [CMY283] and [CMY284] and [CMY285]					
CMY385	**INORGANIC_CHEMISTRY_385**				
NAS_CMY	n a	English	4 + 1	K1	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.) **Prerequisites:** [CMY282] and [CMY283] and [CMY284] and [CMY285]					
COS110	**PROGRAM_DESIGN:INTRODUCTION**				
NAS_COS	n a	Double	4 + 1	S1	16
Object oriented programming, graphical user interfaces and event handling. Teaches sound program design, leading to well structured, robust and documented programmes. Appreciation of the limits of computers. **Prerequisite:** [Par 1.2]					
COS130	**INTRODUCT.TO_PROGRAMMING_130**				
NAS_COS	n a	Double	4 + 1	S1	16
An introduction is given to more advanced data structures. **Prerequisite:** [Par 1.2]					
COS151	**COMPUTER_SCIENCE_151**				
NAS_COS	n a	Bilingual	2 + 1	S1	8
This module introduces concepts and quarterinology related to the hardware of computers, system software and to communication systems. It also provides an understanding of basic algorithmic concepts. A general introduction to the discipline of computer is covered.					
COS160	**COMPUTER_SCIENCE_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_&_ALGORITHMS_212**				
NAS_COS	n a	Double	2 + 1	S1	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. **Prerequisite:** [COS110GS] or [TDH]					
COS213	**ADVANCED_PROGRAMMING_213**				
NAS_COS	n a	Double	2 + 1	S2	12
The module teaches students advanced programming skills using an object oriented					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
programming language that is widely used in industry. The module focuses on design pattern programming as approach to facilitate modular, maintainable and re-usable code. Principles of formal methods are used for program design and specification. **Prerequisite:** [COS212] or [TDH]					
COS221	**DATA_BASES_221**				
NAS_COS	n a	Double	2 + 1	S2	12
A fourth generation language (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 analyzed as examples of perating system design. **Prerequisite:** [COS110] or [TDH]					
COS283	**SYSTEMS_INTEGRATION_283**				
NAS_COS	N a	Double	2 + 1	S2	12
An introduction to coding standards. Networking principles focusing on the use of Java for WWW and network programming, including HTML, scripting (both client-side and server-side), applets, ports and sockets. Remote method invocation (RMI) in Java applications. Database connectivity using JDBC. Students who pass this module may not enroll for INY324. **Prerequisite:** [COS110GS] or [TDH]					
COS284	**COMPUTER_ARCHITECTURE_284**				
NAS_COS	N a	Double	2 + 1	S2	12
The aim of this module 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	**INTROD.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 module exposes students to problems associated with software development on an industrial scale. Overall goals of the module 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					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
requirements each has. To complete the development of a fairly large OO-based software product. The focus of the module 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 module, classical themes in AI are studied such as planning, searching, image recognition, machine learning, etc are studied. 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	**CONCUR.AND_DISTR.SYSTEMS_324**				
NAS_COS	N a	English	2 + 1	S2	18
The module exposes features in a contemporary programming language for controlling and synchronizing concurrent processes. It treats classical topics such as mutual exclusion, semaphores, monitors, deadlock and liveness in quarter of contemporary programming features. It emphasizes the use of high-level textual and graphical notations to model and design concurrent systems before implementation. (NB: This module will be presented for the last time in 2004). **Prerequisite:** [COS222 and Par 2.2]					
COS332	**COMPUTER_NETWORKS_332**				
NAS_COS	N a	English	2 + 1	S2	18
The objective of this module is to acquaint the student with the quarterinology 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 quarterinology, the hierarchy of protocols according to the OSI and TCP/IP models, protocols on the data level, physical level and network level as well as higher level protocols. The practical component of the module involved programming TCP/IP sockets using a high level language. **Prerequisite:** [Par 2.2]					
COS333	**PROGRAMMING_LANGUAGES_333**				
NAS_COS	N a	English	2 + 1	S2	18
The overall goal of the module 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 module illustrates how to build a complete compiler for a mini-language based on Java using a compiler generator. It covers LL and LR parsing, abstract syntax trees, semantic analysis, error recovery and code generation. Emphasis is placed on back-end analysis including inquarterediate codes, basic blocks, register allocation, liveness analysis and garbage collection. **Prerequisite:** [Par 2.2]					
COS343	**TRENDS_IN_INFORM.TECHNOL._343**				
NAS_COS	N a	English	2 + 1	S1	18

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
The content of this module is specifically intended to keep students abreast of new and important trends in IT. The module 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 module 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 and curves and surfaces and visualization. The module 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 module, a student should be able to design and implement computer graphics applications that allow interaction, 3D manipulation of graphic primitives, animation and walk-through, 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. This subject is only for BSc Computer Science students. **Prerequisite:** [WTW126 and 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_ANAT._&_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] or [TDH]					
DAF260	**ANIMAL_ANAT._&_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

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
Homeostasis and Homeorhesis in animals: Thermoregulation. Adaptation of glucose, lipid and protein metabolism in response to short and long-quarter 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 dequarterine 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 module 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 dequarterination; market forms; market failure; calculate and interpret price, income and cross elasticities.					
EKN120	**ECONOMICS_120**				
EB_EKN	n a	Bilingual	3 + 0	S2	10
Conceptualize the interrelationships of the different sectors in South African economy. 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 module that integrates mathematical and statistical techniques with economic theory. Collect, analyze 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

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
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 module 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 module 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 South Africa: monetary policy, fiscal policy, competition policy, labour policy, South African development issues/policies.					
EKN320	**ECONOMICS_320**				
EB_EKN	n a	Bilingual	3 + 0	S2	20
The identification, collection and interpretation process of relevant economic data; the 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-quarter future studies and scenario analysis; overall assessment of the South African 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	**LANGUAGE_PROFICIENCY_(1)_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 quarter 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	**LANGUAGE_PROFICIENCY(2)_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	**LANGUAGE_PROFICIENCY(3)_153**				

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
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	**LANGUAGE_PROFICIENCY(4)_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.					
EOT161	**ACADEMIC_READING_SKILLS_161**				
GW_EOT	N a	English	3 + 0	K1	6
Developing academic reading skills in English, including summarizing, vocabulary building and critical reading. *Not for students who are compelled to enroll for EOT151, EOT152, EOT153, EOT154.					
EOT162	**ACADEMIC_WRITING_SKILLS_162**				
GW_EOT	n a	English	3 + 0	K2	6
Developing academic reading skills in English, including structuring and sustaining arguments, and basic English grammatical and editing skills.. *Not for students who are compelled to enroll for EOT151, EOT152, EOT153, EOT154.					
EOT164	**COMMUNIC._IN_ORGANIZATIONS_164**				
GW_EOT	n a	English	3 + 0	K4	6
This module focuses on the role of language in organizations. Techniques for persuasion, finding information, conducting interviews, etc. are covered, as well as methods used in advertising and skills needed for public speaking. The criteria for drawing up a successful CV, for conducting meetings successfully, writing letters, agendas, minutes and reports are discussed and practiced. *Not for students who are compelled to enroll for EOT151, EOT152, EOT153, EOT154.					
ERG280	**ERGONOMICS_280**				
NAS_VBR	ERG281,282	Afrikaans	2 + 1	S1	8
Study of general ergonomic principals as applied to the design of workplaces, work and ways of performing work. The interactions between the human (user) and his work, workspace and general environment (climate, lighting, and noise, etc.) serve as a point of reference. This module is only presented in Afrikaans.					
ERG281	**ERGONOMICS_281**				
NAS_VBR	ERG281,282	English	2 + 1	S2	8
Study of general ergonomic principals as applied to the design of workplaces, work and ways of performing work. The interactions between the human (user) and his work, workspace and general environment (climate, lighting, and noise, etc.) serve as a point of reference. This module is only presented in English.					
EST120	**AESTHETICS_120**				
NAS_VBR	EST161,162	Bilingual	1 + 1	S2	8
Introduction to aesthetics: framework of approach; physical as premise; role of clothing and clothing environments; perceptual process; factors that influence evaluation. Aesthetics of the product. Design elements in clothing products; visual, tactile, audio and olfactory elements; complexity, order, novelty. **Prerequisite:** [OBG110 GS]					
EST211	**AESTHETICS_211**				
NAS_VBR	EST251,262	Bilingual	2 + 1	S1	10
Aesthetics of the consumer: Figure analysis; color; design elements: clothing product and					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
figure. Aesthetics of the environment: visual presentation in clothing environments. **Prerequisite:** [EST120]					
EST310	**AESTHETICS_310**				
NAS_VBR	EST351,352	Bilingual	0 + 2	S1	8
Analysis, forecast and presentation techniques (+ technical drawings and story boards). Presentation techniques using CAD. **Prerequisite:** [EST210]					
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.					
FBS110	**FINANCIAL_MANAGEMENT_110**				
EB_RFB	n a	Bilingual	3 + 0	S1	10
Purpose and functioning of financial management. Basic financial management concepts. Accounting concepts and the use of the basic accounting equation to describe the financial position of a business. Recording of financial transactions. Relationship between cash and accounting profit. Internal control and the management of cash. Debtors and short-quarter investments. Stock valuation models. Depreciation. Financial statements of a business. Distinguishing characteristics of the different forms of business. Overview of financial markets and the role of financial institutions. Risk and return characteristics of various financial instruments. Issuing ordinary shares and debt instruments. **Prerequisite:** [Par 1.2]					
FBS120	**FINANCIAL_MANAGEMENT_120**				
EB_RFB	n a	Bilingual	3 + 0	S2	10
Analysis of financial statements. Budgeting and budgetary control. Tax principles and normal income tax for individuals. Time value of money and its use for financial and investment decisions. Calculating the cost of capital and the financing of a business to maintain the optimal capital structure. Capital investment decisions and a study of the financial selection criteria in the evaluation of capital investment projects. The dividend decision and an overview of financial risk management. **Prerequisite:** [Par 1.2]					
FBS252	**FINANCIAL_MANAGEMENT_252**				
EB_RFB	n a	Bilingual	3 + 0	K2	8
Business valuation; current asset management; long quarter financing decisions.					
FBS262	**FINANCIAL_MANAGEMENT_262**				
EB_RFB	n a	Bilingual	3 + 0	K4	8
Cost of capital; dequarterination of capital requirements and the financing of a business to maintain the optimal capital structure; dividend decisions.					
FLG211	**INTRODUCTORY_&_NEUROPHYS.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 [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					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
[TDH]					
FLG221	**LUNG/RENAL/ACID-BASE/TEMP._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 the skin and body temperature control. **Prerequisites:** [FLG211] and [FLG212]					
FLG222	**DIGEST.ENDOCR.&_REPROD/SYS222**				
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] and [FLG212] or [TDH]					
FLG311	**APPL.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:** [BCM251 GS] and [BCM252 GS] and [BCM261 GS] and [BCM262 GS] and [FLG221] and [FLG222]					
FLG312	**DEVELOPMENTAL_PHYSIOLOGY_312**				
NAS_FLG	n a	Afrikaans	2 + 0	S1	14
Study on the physiological development and adaptations from the foetus to old age. **Prerequisites:** [BCM251 GS] and [BCM252 GS] and [BCM261 GS] and [BCM262 GS] and [FLG221] and [FLG222]					
FLG313	**RESEARCH_METH.&_LIT.STUDY_313**				
NAS_FLG	n a	Afrikaans	1 + 1	S1	14
Research methodology, career planning, subject orientated literature studies and seminars. **Prerequisites:** [BCM251 GS] and [BCM252 GS] and [BCM261 GS] and [BCM262 GS] and [FLG221] and [FLG222]					
FLG314	**IMMUNOLOGY_314**				
NAS_FLG	n a	Afrikaans	1 + 0	S1	9
Introduction to basic, applied and integrated immunological mechanisms. **Prerequisites:** [BCM251 GS] and [BCM252 GS] and [BCM261 GS] and [BCM262 GS] and [FLG221] and [FLG222]					
FLG322	**INDUSTRIAL_PHYSIOLOGY_322**				
NAS_FLG	n a	Afrikaans	1 + 1	S2	14
Problem orientated module, with the emphasis on occupational health and safety in the industrial environment. Integration of different physiological systems. **Prerequisites:** [BCM251 GS] and [BCM252 GS] and [BCM261 GS] and [BCM262 GS] and [FLG221] and [FLG222]					
FLG323	**PHYSIOL.CONTR.SYST.&_MODELL323**				
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:** [BCM251 GS] and [BCM252 GS] and [BCM261 GS] and [BCM262 GS] and [FLG221] and [FLG222]					
FLG324	**EXERCISE_PHYSIOLOGY_324**				
NAS_FLG	n a	Afrikaans	1 + 1	S2	9

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
Mechanisms of muscle contraction and energy sources. Cardio-respiratory changes, thermoregulation and other adjustments during exercise. Use and abuse of substances to improve performance. **Prerequisites:** [BCM251 GS] and [BCM252 GS] and [BCM261 GS] and [BCM262 GS] and [FLG221] and [FLG222]					
FLG325	**NUTRITION_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 immunology of the digestive tract. **Prerequisites:** [BCM251 GS] and [BCM252 GS] and [BCM261 GS] and [BCM262 GS] and [FLG221] and [FLG222]					
FLG327	**HIGHER_NEUROLOGICAL_FUNCT.327**				
NAS_FLG	n a	Afrikaans	0 + 2	S2	20
Tutorials and seminars on higher functions of the brain and interaction between the neurological, endocrine and immune systems. **Prerequisites:** [BCM251 GS] and [BCM252 GS] and [BCM261 GS] and [BCM262 GS] and [FLG221] and [FLG222]					
FLG328	**PATHOPHYSIOLOGY_328**				
NAS_FLG	n a	Afrikaans	1 + 0	S2	9
Human pathophysiology. **Prerequisites:** [BCM251 GS] and [BCM252 GS] and [BCM261 GS] and [BCM262 GS] and [FLG221] and [FLG222]					
FPP451	**CHEM/MICROBIOL_ASPEC/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. Dequarterination 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 utilization of micro-organisms in food production. **Prerequisite:** [Third-year status in Food Science or TDH]					
FPP452	**FOOD_PROC.EQUIP/OPERATIONS_452**				
NAS_VDW	VOV485	English	3 + 0.5	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	**APPRO.FOOD_PRES.VATION_TECH_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]					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
FPP462	**APPRO.FOOD_PROCES._TECHNO._462**				
NAS_VDW	VOV483	English	2 + 0.5	K4	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	S2	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 modeling & 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 and 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. **Prerequisites:** [FRK151 GS] and [FRK152 GS]					
FRK151	**FINANCIAL_ACCOUNTING_151**				
EB_FRK	n a	Bilingual	4 + 0	K1	5
Computer-assisted training: The nature and function of Accounting. The 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. **Prerequisites:** [FRK151 GS] and [Par.1.2]					
FRK181	**FINANCIAL_ACCOUNTING_181**				
EB_FRK	N a	Bilingual	2 + 0	S2	3
Computer processing of accounting information. **Prerequisites:** [FRK151 GS] and [Par 1.2]					
FSG110	**PHYSIOLOGY_110**				
BA_GW	N a	Bilingual	3 + 0	S1	6

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
Information available at the Department.					
FSG120	**PHYSIOLOGY_120**				
BA_GW	n a	Bilingual	3 + 0	S2	6
Information available at the Department. **Prerequisite:** [FSG110 GS]					
FSK116	**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:** [WTW114 #] and [Par 1.2]					
FSK126	**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	**INTRO/FOOD_SCIENCE_&_TECH._250**				
NAS_VDW	VDW211	English	2 + 1	S1	12
Lectures: How food is produced, processed and distributed (food pipeline). Human nutrition and human food requirements. Constituents of foods. Food quality. Food deterioration and control (food preservation). Unit operations in food processing. Food safety, risks and hazards. Selected food industries. Principles of food packaging. Food legislation and labeling. 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	**PRIN/FOOD_PROC._&_PRESERV._260**				
NAS_VDW	VDW222	English	2 + 1	S2	12
Lectures: Raw material preparation: storage, cleaning, sorting, grading and peeling. Food conversion processes: emulsification and homogenization; mixing and forming; mechanical separations). Food preservation technologies: concept of hurdle technology; heat (blanching, pasteurization and sterilization); 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] and [PHY131] and [WTW134] or [TDH]					
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-(1)_351**				
NAS_VDW	VDW314	English	2 + 1	S1	18
Lectures - Chemistry of major food components: Carbohydrates. Proteins. Lipids. Water. Chemical and nutritional aspects of food processing: implications of different processing 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.					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
Prerequisites: [BCM251] and [BCM252] and [BCM261] and [BCM262] or [TDH]					
FST352	**FOOD_CHEMISTRY-(2)_352**				
NAS_VDW	VDW324	English	2 + 1	S1	18
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. **Prerequisite:** [FST351]					
FST353	**FOOD_ENGINEERING_353**				
NAS_VDW	LPR311,312	English	3 + 0.5	S1	18
Lectures- Mass and energy balance. Heat transfer theory: Convection, conduction and radiation. Energy for food processing. Fluid flow and rheology. Unit operations: materials handling, cleaning, sorting, grading, peeling, disintegration, separation (e.g. membrane technology), pumping, mixing and forming, heating, concentration, drying, extrusion, refrigeration, freezing. Tutorials/practicals - Calculations on mass and energy balances, psychrometry, refrigeration and freezing. **Prerequisites:** [CMY117] and [CMY127] and [FST260] and [PHY131] and [WTW134] or [TDH]					
FST361	**ANIMAL_FOOD_SCIENCE_361**				
NAS_VDW	n a	English	2 + 1	S2	18
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 dequarterinations, egg quality and protein functionality. **Prerequisites:** [FST250] and [FST260] and [FST351] and [FST352] or [TDH]					
FST400	**RESEARCH_METHODOLOGY_&_SEM.400**				
NAS_VDW	FST453	English	2 + 1	S2	20
Lectures and practicals/assignments: Research methodology. Literature study and seminar presentations on topics in Food Science and/or Technology. **Prerequisite:** [Third-year status] or [TDH]					
FST401	**ANIMAL_FOOD_TECHNOLOGY_401**				
NAS_VDW	FST452	English	3 + 1.5	J1	30
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, flavored milk beverages, dairy-fruit juice mixtures; ice cream and other frozen desserts; yoghurt and cultured milk products; cheeses. Evaluation and analysis of 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]					
FST402	**PLANT_FOOD_TECHNOLOGIES_402**				

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
NAS_VDW	FST462	English	3 + 1.5	J1	30
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 of nutritional, sensory and microbiological quality. Practical work: Practical execution of the processes described above in pilot factory; factory visits; execution and reporting of a practical project on extended shelf life of fresh juice or of minimally processed fruits and vegetables. 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 dequarterine 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]					
FST410	**PRODUCT_DEVELOPMENT_410**				
NAS_VDW	VDW442,FST461	English	2 + 1	S1	20
Lectures: Principles involved and steps followed in the development of new food products. Practicals: Applying the theory of food product development: A product development project will be planned, executed and presented orally and in a written format. **Prerequisites:** [FST260] and [FST351] and [FST352] or [TDH]					
FST411	**SENSORY_ANAL.&QUAL.MAN.SYS.411**				
NAS_VDW	VDW442,FST461	English	2 + 1	S1	20
Lectures: Quality management systems with specific reference to Good Manufacturing Practices, HACCP and ISO 9000. Principles and applications of sensory evaluation. Types of panels, tests and test conditions and their functions. Selection and training of panellists for descriptive sensory evaluation. Instrumental sensory quality measurements. Statistical analysis and interpretation of data. Application and implementation of HACCP. Practicals: Practical aspects and execution of sensory evaluation techniques, analysis and interpretation of data. Instrumental sensory quality measurements. **Prerequisites:** [FST260] and [FST351] and [FST352] or [TDH]					
FST420	**ADVANCED_FOOD_SCIENCE_420**				
NAS_VDW	FST451	English	2 + 1	S2	20
Lectures: Lectures in advanced level food chemistry, food microbiology, food engineering, food processing and nutrition. Problem solving and literature discussion. Practicals and/pr assignments: Advanced techniques of analyses and applications or assignments in food chemistry, food microbiology, food engineering, food processing and nutrition. **Prerequisite:** [Third-year status] or [TDH]					
FST463	**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	n a	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**				

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
NAS_GGY	n a	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	n a	Double	4 + 0	K2	6
Geography of tourism: conceptualization; 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 module will trace the major changes in the economic, political and population geography of Southern Africa including those associated with the formation of the SADC.					
GGY162	**REMOTE_SENSING_162**				
NAS_GGY	n a	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	n a	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 utilization, management and mismanagement in South Africa. **Prerequisite:** [Par 1.2]					
GGY164	**PHYSICAL_GEOGRAPHY_OF_SA_164**				
NAS_GGY	n a	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	n a	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	n a	English	4 + 2	K3	12
Theoretical constructs for the single and multi-nodal forms of the western city. Modeling 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	n a	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**				

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
NAS_GGY	n a	English	4 + 2	S1	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 emphasized rather than mastering software. This module is also presented in the second semester.					
GGY353	**URBAN_DEVELOPMENT_STUDIES_353**				
NAS_GGY	n a	English	4 + 2	K2	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	n a	English	4 + 2	K1	18
Principles of development, perspectives on development. Aspects of development strategy such as population growth, urbanization, rural development. Development in Third World cities. Frameworks for development in South Africa.					
GGY361	**ENVIRONM.GEOMORPHOLOGY_361**				
NAS_GGY	n a	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_MANAGEM.362**				
NAS_GGY	n a	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	n a	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. (Module for Landscape Architecture and Architecture students)					
GIS220	**GEOGRAPHIC_DATA_ANALYSIS_220**				
NAS_GGY	n a	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_SYS.310**				
NAS_GGY	n a	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	n a	English	3 + 1	S2	24

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
Introduction to spatial analysis techniques including classification, interpolation, extrapolation, geo-referencing, kriging, topology, visualization, 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 fertilization. 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_FERTIL.&_PLANT_NUTRIT.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 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 module for students in Agricultural Engineering). **Prerequisite:** [CMY117 GS]					
GKD350	**SOIL_CLASSIF.&_SURVEYING_350**				
NAS_PGW	GKD317	Bilingual	2 + 1	S1	14
A taxonomic system for South Africa. USDA's Soil Taxonomy. Land suitability evaluation. Optimal resource utilization. The conservation component. Ecological aspects. Ecotype, 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	1 + 0.5	S1	10
A study of some soil physical properties of soil: structure, texture, compacting and crusting. Sedimentation and sieve analyses for the dequarterination of particle sizes. Conduction of heat. Practical work: Dequarterination 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 is explained. **Prerequisite:** [GKD250]					
GKD450	**SOIL_MINERAL._&_SOIL_GENES.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

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
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. Integrated environmental management. 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. **Prerequisites:** [GKD250] and [GKD350]					
GKD480	**RESOURCE_SURVEYS_480**				
NAS_PGW	GKD487	Bilingual	3 + 1	S2	14
Techniques for the execution of detailed soil surveys (including field word 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. **Prerequisites:** [GKD250] and [GKD350]					
GLY151	**INTRODUCTORY_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; Africa 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. **Prerequisite:** [Par 1.2]					
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. **Prerequisite:** [Par 1.2]					
GLY251	**CRYSTAL_OPTICS_&_CRYS.CHEM.251**				
NAS_GLY	GLY214	English	4 + 2	K1	12
The properties of light in isotropic and anisotropic solids; the polarizing microscope; nature					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
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 quarter 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. Mapping techniques.					
GLY254	**STRUCTURAL_GEOLOGY_254**				
NAS_GLY	GLY216	Bilingual	4 + 2	K1	12
Integrated theoretical and practical module 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. Mapping techniques.					
GLY261	**IGNEOUS_PETROLOGY_261**				
NAS_GLY	GLY316	English	4 + 2	K3	12
Classification and nomenclature of igneous rocks. The nature of silicate melts; physical and chemical factors influencing crystallization and textures of igneous rocks. Phase diagrams, fractional crystallization and partial melting. Trace elements and isotopes, and their use in petrogenetic studies. Global distribution of magmatism and its origin. Mid-oceanic ridges, active continental margins, intraplate magmatism.					
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	**SA_STRATIGRAPHY_&_ENG.GEOL.263**				
NAS_GLY	n a	Bilingual	4 + 2	K3	12
The crystal 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					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
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, electromagnetic, 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 modeling; classification of aquifers in southern Africa; groundwater exploration and management. Mapping techniques.					
GLY352	**ORE_FORMATION_352**				
NAS_GLY	GLY323(partially)	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 techniques. **Prerequisite:** [GLY261]					
GLY361	**ORE_DEPOSITS_361**				
NAS_GLY	GLY323(partially)	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. Mapping techniques.					
GLY362	**GEOSTAT.&_ORE_RESERV._CALC.362**				
NAS_GLY	GLY323(partially)	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. Mapping techniques.					
GMA220	**REMOTE_SENSING_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. The principles of Global Positioning Systems and elementary stereo mapping. **Prerequisite:** [GPS220] or [TDH]					
GMA320	**REMOTE_SENSING_320**				
NAS_GGY	n a	English	3 + 1	S2	24
The advanced theory and application of satellite image analysis, transformation and classification. Stereoscopic mapping. 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. Practical digital mapping. **Prerequisite:** [GGY132]					
GMC210	**CARTOGRAPHY_210**				
NAS_GGY	n a	English	3 + 1	S1	12
Rules of graphical communication and the depiction of spatial data. Projections, Graphical elements of design and symbolization and visualization of spatial referenced data in application areas such as sociology, economics, environmental management, etc.					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
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. The cognitive processes of spatial data capture and spatial data visualization. Knowledge-based map design techniques. Multimedia and virtual reality as visualization techniques. The role of Cartography in information visualization systems. **Prerequisite:** [GMC210]					
GMT320	**PROJECT:_GEOMATICS_320**				
NAS_GGY	n a	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]					
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	**GRAVITY_METHODS_361**				
NAS_GLY	GPH312(partially)	Bilingual	4 + 2	K3	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; isostacy; terrain corrections; field surveys, data presentation; filter and contour techniques; rock densities; interpretation techniques and algorithms; computer interpretations.					
GPH362	**MAGNETIC_METHODS_362**				
NAS_GLY	GPH312(partially)	Bilingual	4 + 2	K4	18
Fundamental magnetization theory; magnetic potential; units; geomagnetic field; magnetic anomalies; origin and shape of; magnetic susceptibilities of rocks; palaeomagnetism and global tectonics; magnetometers; field surveys; aeromagnetic surveys; data presentation and manipulation; filters; interpretation techniques; algorithms for the calculation of the magnetic effect due to bodies with arbitrary shapes. Quantitative and qualitative computer interpretation.					
GSS310	**FAMILY_STUDIES_310**				
NAS_VBR	GSS351,352	Bilingual	2 + 0	S1	8
Roles, responsibilities and development tasks of family members during the life cycle regarding aspects concerning food, nutrition, clothing, housing. **Prerequisite:** [Prescribed Psychology and Sociology modules up to 200 level]					
GTS124	**GENETICS_124**				
NAS_GTS	n a	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**				

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
NAS_GTS	GTS122	Double	2 + 0.5	S2	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 dequarterination and sex linked traits. Inheritance of cytoplasmic DNA and cytoplasmic effects. **Prerequisite:** [MLB111 GS] or [TDH]					
GTS251	**GENE_&_CHROMOSOME_ORGANIZ._251**				
NAS_GTS	GTS215 and GTS217	English	2 + 0.5	S1	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_ANAL._&_MANIPULA._261**				
NAS_GTS	GTS215 and GTS217	English	2 + 0.5	S2	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_CON.&_DEVL.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	**ADV._POPULATION_GENETICS_353**				
NAS_GTS	GTS326	English	2 + 1	S1	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 Xchromosome 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.					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
Prerequisites: [GTS251 GS] and [GTS261 GS] or [TDH]					
GTS362	**INTRODUCTION_TO_PLANTBREED.362**				
NAS_GTS	GTS316	English	2 + 1	S2	18
Genetic systems, recombination and variability. Population structure and variability. Sources of variation including induced mutations, hybridisation 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	**EVOLUTIO._&_PHYLO-GENETICS_363**				
NAS_GTS	n a	English	2 + 1	S2	18
Origin of life's code. Molecular evolution and analytical tools. Dequarterining 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. **Prerequisite:** [GTS353 GS] or [TDH]					
GTS364	**GENETICS_364**				
NAS_GTS	n a	English	2 + 1	S2	9
Capita selecta. 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.					
GTS451	**SEMINAR_&_TECHNIQUES_MODULE451**				
NAS_GTS	GTK401 and GTK403	English	4 + 1	K1	18
Techniques module: molecular techniques, plant tissue culture and transformation, DNA genotyping and analysis, hybridisation 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	K2	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, modeling. **Prerequisite:** [GTS362 GS] or [TDH]					
GTS461	**PLANTBREEDING_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_PLANTBREED.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]					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
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	S2	13
Capita selecta from SGM 322.					
GVK420	**LARGE_STOCK_SCIENCE_420**				
NAS_VKU	n a	Afrikaans	2 + 0	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]					
HBS410	**HOME_MANAGEMENT_410**				
NAS_VBR	HBS451,452	Bilingual	2 + 0	S1	8
The household as a management unit. Optimal use of resources. **Prerequisite:** [Fourth-year status]					
HBS420	**HOME_MANAGEMENT_420**				
NAS_VBR	HBS461,462	Afrikaans	2 + 0	S2	8
Personal and household financial management. **Prerequisite:** [HBS410 GS]					
HSC252	**CROP_PRODUCTION_252**				
NAS_PGW	TBK221	Bilingual	2 + 0.5	S1	12
Propagation by seed: seed development, including pollination, fertilization, 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. **Prerequisite:** [BOT161 or BLG150]					
HSC261	**TREE_GROWTH_&_DEVELOPMENT_261**				
NAS_PGW	TBK221	English	2 + 0.5	K3	6
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. **Prerequisites:** [GKD250] and [GKD260 #] and [HSC252]					
HSC350	**CITRICULTURE_350**				
NAS_PGW	TBK410	Bilingual	3 + 1	S1	14
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 phonology, 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]					
HSC351	**NURSERY_MANAGEMENT_351**				

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
NAS_PGW	STZ311	Bilingual	2 + 0.5	S1	14
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.					
HSC362	**DECIDUOUS_POMOLOGY_362**				
NAS_PGW	TBK320	English	2 + 0.5	S2	14
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]					
HSC450	**SUBTROPICAL_POMOLOGY_450**				
NAS_PGW	TBK314	Bilingual	2 + 0.5	S1	14
Integration of the seasonal phonology 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. **Prerequisites:** [HSC252] and [HSC261] and [PPK251]					
HSC460	**PROD.SYS.1V:SUBTROP.FRU.PR.460**				
NAS_PGW	HSC483	English	2 + 0.5	S2	12
Integration of the seasonal phonology 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.Identification of ornamental plants for commercial and landscape use. Climatic, reproduction and maintenance requirements of above mentioned 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.					
HSC470	**PROD.SYS.111:TEMP.FRUIT.PR.470**				
NAS_PGW	HSC484	English	2 + 0	S1	10
Integration of seasonal phonology 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]					
HSC490	**ORNAMENT_HORTICULTURE_490**				
NAS_PGW	HSC352,451	Bilingual	2 + 0.5	S1	14
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. Identification of ornamental plants for commercial and landscape use. Climatic, reproduction and maintenance requirements of above mentioned trees, palms, shrubs, flowering plants, ground covers, climbers and indoor plants. Functional and aesthetic value of plants in a landscape or indoors. Excursions to nurseries and practical experience on the experimental farm is compulsory for all participants in this module.					
IAS211	**ACTUARIAL_MATHEMATICS_211**				
NAS_VWT	IAS251, 252	Bilingual	2 + 1	S1	12
Accumulation functions, interest, time value of money, compounding periods, cashflow models, equations of value, annuities certain, continuous time application, loan schedules. Life tables, derivation of contingent probabilities from life tables, contingent payments, fundamentals of survival models, simple laws of mortality, expectation of life, elementary					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
survival contracts, commutation functions, premiums for elementary survival contracts. **Prerequisites:** [WTW114] and [WTW128]					
IAS221	**ACTUARIAL_MATHEMATICS_221**				
NAS_VWT	IAS251, 252	Bilingual	2 + 1	S2	12
Select and ultimate life tables, advanced life annuities, accumulation and discounting, life insurance, net and gross premiums, reserves. Performance measurement, unitized funds, inflation adjustments, project evaluation, fixed interest securities. **Prerequisite:** [IAS211 GS]					
IAS261	**LIFE_ASSURANCE_PRAC.IN_RSA_261**				
NAS_VWT	n a	Bilingual	3 + 0	K3	12
Structure of and organizations in the life assurance industry, products, law, tax, organization and operation of the insurer, personal financial planning. This module is not presented every year - please consult the Head of Department. **Prerequisite:** [IAS211 GS]					
IAS262	**LIFE_ASSURANCE_PRAC.IN_RSA_262**				
NAS_VWT	n a	Bilingual	3 + 0	K4	12
Life assurance policy design and rating, policy values and alterations, actuarial valuation, surplus, reinsurance, investment of life assurance funds. This module is not presented every year - please consult the Head of Department. **Prerequisites:** [IAS211 GS] and [IAS221 #]					
IAS351	**SHORT-QUARTER_INS.PRAC.IN_RSA_351**				
NAS_VWT	n a	Bilingual	3 + 0	K1	18
Structure of and organizations in the short quarter insurance industry, law, types of insurance, Lloyds, risk management. **Prerequisite:** [IAS211 GS]					
IAS352	**SHORT-QUARTER_INS.PRAC.IN_RSA_352**				
NAS_VWT	n a	Bilingual	3 + 0	K2	18
Short-quarter insurance rating, reserving, reinsurance, investment of short-quarter insurance funds. **Prerequisites:** [IAS211 GS] and [IAS221 GS] and [IAS351 GS]					
IAS361	**RETIREMENT_FUND_PRAC.I_RSA_361**				
NAS_VWT	n a	Bilingual	3 + 0	K3	18
Structure of and organizations in the retirement fund industry, instruments, typical benefits, law, tax, retirement fund design. **Prerequisite:** [IAS211 GS]					
IAS362	**RETIREMENT_FUND_PRAC.I_RSA_362**				
NAS_VWT	n a	Bilingual	3 + 0	K4	18
Retirement fund design, financing, role of the actuary, investment of funds, group insurance. **Prerequisites:** [IAS211 GS] and [IAS221 GS] and [IAS361 GS]					
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.					
INB320	**INTERIOR_PLANNING_320**				
NAS_VBR	INT361,362	Bilingual	1 + 1	S2	12
The planning and arrangement of existing living and working spaces to provide for the various needs of the individual, family or group. Evaluation of floor plans; arrangement of					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
furniture. **Prerequisites:** [ITW310] and [OBG110]					
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]					
INB410	**INTERIOR_PLANNING_410**				
NAS_VBR	INK451,452	Bilingual	1 + 1	S1	10
Advanced interior planning **Prerequisites:** [INB320] and [OKU220]					
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 modeling. **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 modeling, normalization, database development life cycle, practical introduction to database design. Databases: Advanced entity relationship modeling and normalization, object-orientated databases, database development life cycle, advanced practical database design.					

Module	Title				
Fac_Dept	**Old code**	**Language**	**Ipw/ppw**	**Quarter**	**Credits**
Prerequisites: [CIL171] and [CIL172] and [CIL173] and [CIL174]					
INF261	**INFORMATICS_261**				
EB_INF	n a	Bilingual	3 + 2	K3	7
Database management; transaction management, concurrent processes, recovery, database administration: new developments: distributed databases, client-server databases: practical implementation of databases. **Prerequisite:** [INF214 GS]					
INF262	**INFORMATICS_262**				
EB_INF	n a	Bilingual	3 + 2	K4	7
Operating systems: memory management, processor management, device management, file management, system management, concurrent processes, practical application in commercial operating systems.					
INF271	**INFORMATICS_271**				
EB_INF	INF253	Bilingual	2 + 0	J1	14
Systems analysis, systems design: construction, application architecture, input design, output design, interface design, use of computer-aided development tools, programming. **Prerequisites:** [CIL171] and [CIL172] and [CIL173] and [CIL174] and [INF163] and [INF164] and [Reg1.2(m)]					
INF272	**INFORMATICS_272**				
EB_INF	INF263	Bilingual	2 + 0	J1	14
Systems design: internal controls, program design, object design; project management, system implementation, use of computer-aided development tools, advanced programming. **Prerequisites:** [CIL171] and [CIL172] and [CIL173] and [CIL174] and [INF164] and [Reg1.2(m)]					
INK110	**INTERIOR_PRODUCTION_110**				
NAS_VBR	INK151,152	Bilingual	1 + 1	S1	12
Basic and more advanced construction and sewing techniques; use of various sewing machines and materials in the construction of selected interior products.					
INK210	**INTERIOR_PRODUCTION_210**				
NAS_VBR	INK261,262	Bilingual	1 + 1	S1	12
Evaluation of ready-made interior products; measuring, planning and construction of custom-made interior products: window coverings, upholstery and assorted furnishings. **Prerequisite:** [INK110]					
INK310	**INTERIOR_PRODUCTION_310**				
NAS_VBR	INF351,352	Bilingual	1 + 1	S1	12
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:** [INK210]					
IPO380	**INTERIOR_EXPERIENTIAL_TRAI.380**				
NAS_VBR	INK451,452	Bilingual	1 + 0	S2	10
Controlled experiential training.					
IPO480	**INTERIOR_EXPERIENTIAL_TRAI.480**				
NAS_VBR	INK451,452	Bilingual	1 + 0	S2	10
Controlled experiential training.					
ITP480	**PROJECT_INTERIOR_MERCH._480**				
NAS_VBR	ITP461	Bilingual	1 + 0	J1	20
Project to illustrate the ability to integrate relevant theory in the planning and presentation of an interior merchandise project for specific clients.					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
Prerequisites: [SEM320] and [Final-year status]					
ITW120	**INTERIOR_MERCHANDISE_120**				
NAS_VBR	ITW161,162,251	Bilingual	2 + 1	S2	12
Household material and equipment studies: Metals and non-metals used for the manufacturing of objects, equipment and components of appliances for household use. Study and evaluation of selected non-electrical household equipment in quarter of specific end-use situations.					
ITW220	**INTERIOR_MERCHANDISE_220**				
NAS_VBR	ITW261,262,451	Bilingual	2 + 1	S2	12
Equipment studies: study of major and portable electrical household appliances in quarter of consumer needs, specific end-use situations, running and life cycle costs, sustainability aspects and environmental concerns to facilitate consumer decision making.					
ITW310	**INTERIOR_MERCHANDISE_310**				
NAS_VBR	ITW351,352	Bilingual	2 + 1	S1	12
Choice of lifestyle products (furniture and textile products), wall and floor finishing and lighting in specialized spaces. **Prerequisites:** [ITW120] and [TKS210]					
KEP220	**CULTURAL_EATING_PATTERNS_220**				
NAS_VBR	VDG120/KEP261	Bilingual	3 + 0	S2	8
Origin and development of food habits; Factors influencing habits and choice; Dynamics of food habits. Influence of religion on food habits. Food habits of different ethnic groups. The influence of culture on cuisines. Study of the cuisines of selected African, European and Eastern countries.					
KEP261	**CULTURAL_EATING_PATTERNS_261**				
NAS_VBR	VDG120	Bilingual	3 + 0	K3	4
Origin and development of food habits; Factors influencing habits and choice; Dynamics of food habits. Influence of religion on food habits. Food habits of different ethnic groups.					
KEP262	**CULTURAL_EATING_PATTERNS_262**				
NAS_VBR	VDG120	Bilingual	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	K2	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	n a	Double	3 + 0	K4	15
This module focuses on the art historical concepts of representation and identity in contemporary South African art. Different aspects of representation and identity are investigated by means of the art of artists such as Leora Faber, Wilma Cruise, Robert Hodgins, Tommy Motswai and Minette Vari.					
KLD220	**CLOTHING_220**				
NAS_VBR	KLD261,262	Bilingual	3 + 0	S2	8
Costume and fashion history: Appearance characteristics of Western dress. Influencing factors. Evolution of styles from Ancient Egyptian up to and including the present.					
KLD221	**CLOTHING_221**				

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
NAS_VBR	KLD353,354,363	Bilingual	3 + 0	S2	8
Cultural orientation and dress: Scope, culture creation and dress, dress and adaptation to society; functions of dress. Cultural context and dress: reflection of human adaptation; culture creations (technical, moral and ceremonial patterns); societies and clothing; beauty standards and beauty ideals. 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.					
KLD320	**CLOTHING_320**				
NAS_VBR	KLD352,361,362	Bilingual	4 + 0	S2	12
Social-Psychological aspects of clothing: Development of a framework; Symbolic-Interaction as a framework; the cognitive approach. Development of the self: the body as indicator; personal values and norms. Appearance management and presentation of the self: role acceptance, identity, social control, roles in social cognition.					
KLD321	**CLOTHING_321**				
NAS_VBR	KLD364,365	Bilingual	2 + 0	S2	6
Clothing textile product utilization in South Africa: A clothing consumer model; demographic and psycho-graphic image; knowledge and information needs; rights and support; communication and source of information. Clothing consumer behaviour of different groups: the family and family life-cycle and applicable groups; physical development; wardrobe planning. **Prerequisite:** [TKS220 GS]					
KLD410	**CLOTHING_410**				
NAS_VBR	KLD451,464,465	Bilingual	3 + 0	S1	8
The South African clothing industry: basic principles of fashion; fashion production: Haute Couture and ready-to-wear. Retail and wholesale: Ranges of clothing; textiles, footwear and accessories merchandise; merchandise characteristics; customer service as; packing and packaging. Global interdependence: appreciation of cultural differences; respect for diversity. **Prerequisite:** [Fourth-year status]					
KLD411	**PROJECT_CLOTHING_411**				
NAS_VBR	KLD452,461	Bilingual	2 + 0	S1	6
Marketing aspects: fashion as a product and the consumer; fashion-marketing communication. Visual merchandising: basic components; tools and techniques; planning. **Prerequisite:** [Fourth-year status]					
KLD412	**CLOTHING_412**				
NAS_VBR	KLD456,457	Bilingual	3 + 0	S1	8
The small business enterprise: Introduction: clothing small business enterprises; types and locations. Marketing aspects: target market selection; product mix; pricing methods; distribution channels; marketing communication mix; financial aspects. **Prerequisite:** [Fourth-year status]					
KLD420	**CLOTHING_420**				
NAS_VBR	KLD453,454,462	Bilingual	3 + 0	S2	8
General managerial aspects: Planning, purchasing, control; search for suppliers; relationship with suppliers; management roles and responsibilities; technology; ethical and legal behaviour. Introduction: factors influencing stock movement; redistribution of stock; merchandising processes. Planning stock movement; factors influencing buying strategies. **Prerequisite:** [Fourth-year status]					
KLD421	**CLOTHING_421**				
NAS_VBR	KLD466,467	Bilingual	3 + 0	S2	8
The small business enterprise: General management functions: purchase planning; job					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
description and employment; administrative systems; legal and ethical behaviour. Product presentation: fashion shows; planning; tools and techniques. **Prerequisite:** [Fourth-year status]					
KLR110	**CLOTHING_PRODUCTION_110**				
NAS_VBR	KLR151,152	Bilingual	1 + 1	S1	12
A study of sewing appliances and equipment and the handling and use of different types of fabric. Functional and creative sewing techniques; grading and quality assurance.					
KLR120	**CLOTHING_PRODUCTION_120**				
NAS_VBR	KLR161,162	Bilingual	1 + 1	S2	12
Processes (collars, pockets, buttonholes, fasteners, belts, hems, etc.) Application: Unstructures, multi-sized garment or selected interior product. **Prerequisite:** [KLR110]					
KLR210	**CLOTHING_PRODUCTION_210**				
NAS_VBR	KLR251,252	Bilingual	1 + 1	S1	12
Pattern use and good fitting. Customized garment. **Prerequisite:** [KLR120]					
KLR220	**CLOTHING_PRODUCTION_220**				
NAS_VBR	KLR261	Bilingual	0 + 1	S2	6
Tailoring. **Prerequisite:** [KLR120]					
KLR310	**CLOTHING_PRODUCTION_310**				
NAS_VBR	KLR262	Bilingual	1 + 1	S1	12
Small-scale production: Industrial machines, production systems, quality assurance. **Prerequisite:** [KLR210]					
KLR320	**CLOTHING_PRODUCTION_320**				
NAS_VBR	KLR352,451	Bilingual	1 + 1	S2	12
Flat pattern design. Production design (flat pattern design + CAD). **Prerequisite:** [KLR210]					
KLR410	**CLOTHING_PRODUCTION_410**				
NAS_VBR	KLR361,362	Bilingual	1 + 1	S1	12
Draping design. Application: customized outfit. **Prerequisite:** [KLR210]					
KLR420	**CLOTHING_PRODUCTION_420**				
NAS_VBR	KLR452,461,KLD455	Bilingual	1 + 1	S2	12
Production: product analysis, planning and execution. Application clothing, textile and consumer knowledge by utilizing a CAD-programme for planning and assembling apparel. **Prerequisites:** [EST310] and [KLR310]					
KOB181	**COMMUNICATION_MANAGEMENT_181**				
EB_BEM	n a	Bilingual	3 + 0	K3	5
Information available at the Department.					
KOB261	**COMMUNICATION_MANAGEMENT_261**				
EB_BEM	n a	Bilingual	3 + 0	K3	8
Information available at the Department.					
KTP100	**EXPERIENTIAL_TRAINING_100**				
NAS_VBR	n a	Bilingual	1 + 0	J1	6
Compulsory practical training in the clothing industry during the first year, approved in consultation with the head of the department.					
KTP200	**EXPERIENTIAL_TRAINING_200**				

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
NAS_VBR	n a	Bilingual	1 + 0	J1	4
Compulsory practical training in the clothing industry during the second year, approved in consultation with the head of the department.					
KTP300	**EXPERIENTIAL_TRAINING_300**				
NAS_VBR	n a	Bilingual	1 + 0	J1	4
Compulsory practical training in the clothing industry during the third year, approved in consultation with the head of the department.					
KTP400	**EXPERIENTIAL_TRAINING_400**				
NAS_VBR	KTP451,461	Bilingual	0 + 2	J1	20
Project in field of application: planning and execution. **Prerequisite:** [Fourth-year status]					
KTP401	**EXPERIENTIAL_TRAINING_401**				
NAS_VBR	n a	Bilingual	1 + 0	J1	4
Project in field of application: execution.					
KVK420	**SMALL_STOCK_SCIENCE_420**				
NAS_VKU	n a	Afrikaans	2 + 0	S2	12
Small stock management, shearing organization, 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. Mathematical modeling of implement systems.					
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.					
LBU410	**LAND_USE_PLANNING_410**				
NAS_PGW	PGW460,GKD430, LBU481	Bilingual	3 + 1	S1	14
Land suitability evaluation: background, principles and applications; aspects concerned, methods and resources (maps, reports, other resources).; Land suitability evaluation: background, principles and applications; steps of the planningprocess, critical aspects; application and examples. Land use planning focues on irrigation-, dry land- and intensive agriculture: principles and critical aspects. **Prerequisite:** [GKD250]					
LBU420	**PROJECT:LAND_USE_PLANNING_420**				
NAS_PGW	n a	Bilingual	3 + 1	S2	14

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
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_ECONOMICS_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. **Prerequisites:** [LEK251] and [LEK252 or EKN113 and/or EKN120]					
LEK251	**INTR._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	**INTR.TO_AGRIC._PROD._ECON._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-quarter business costs; Economics of short-quarter decisions. Economics of input substitution: Least-cost use of inputs for a given output, short-quarter 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	**AGRICULTURAL_ECONOMICS_310**				
NAS_LEK	n a	English	3 + 0	S1	12
Historical evolution of South African agricultural policy. Agriculture and the state: reasons for government intervention. 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	**AGRICULTURAL_ECONOMICS_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.					
LEK415	**AGRICULTURAL_ECONOMICS_415**				
NAS_LEK	n a	Bilingual	3 + 1	S1	18
To prepare students for taking the Safex Agricultural Markets Division brokerage exam. Giving an in-depth knowledge on the importance of hedging. Giving an in-depth knowledge on designing and implementation of low/zero risk hedging strategies. Introduction to the mathematics of portfolio management and mathematical modeling of derivatives. Working knowledge of the mathematical relationships in the management of a hedged portfolio. Working knowledge on the applicable software for managing derivative portfolios. Introduction into the management of option portfolios. To expand the thinking on the uses					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
of derivatives, by also dealing with the hedging of diesel cost, interest rates and weather events. **Prerequisites:** [LEK210] and [LEK220] and [[EKN110, 120 or FRK100, 110, 120 of OBS110, 120 or FBS210, 220. WTW at the first-year level or STK110, 120]]					
LEK421	**AGRICULTURAL_ECONOMICS_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	**AGRI.DEMAND_&_SUPP.ANALYSIS451**				
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. Practical experience in the formulation of these models will be attained from practical sessions. Student will submit a project in which he/she must analyze 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-quarter time periods. A brief look at price dequarterination 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. All of this will be supported by the relevant practical sessions. The relevance of changes to the main macro economic indicators will be discussed through out this module. **Prerequisites:** [LEK252] and [LEK261] and [LEK262] and [STK281]					
LEK463	**AGRIC.FINANC.MANA.&_MARKET_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_&_APPR._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.					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
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_CONSERV._&_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, dequarterination 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	LKM221	Bilingual	2 + 0.5	S2	12
Capita selecta from Agroclimatology (LBU260).					
LKM450	**ENVIRONMENTAL_BIOPHYSICS_450**				
NAS_PGW	LKM451,452	Bilingual	2 + 0.5	S1	16
Environmental variables. Quantitative description and measurement of atmospheric environmental variables and water in organisms. Mass and energy fluxes. Quantitative description of energy fluxes in organisms' environments. Energy balances of animals and plant communities will be derived.					
LKW222	**AGRIC._POWER_MACHINERY_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
The 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 and structures, waste control and					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
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. Pasteurization, sterilization 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	**AGRIC.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. Practical training in verbal communication. Procedures at meetings.					
MBY161	**INTRODUCTION_TO_MICROBIOLO.161**				
NAS_MBY	n a	Bilingual	2 + 0.5	S2	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_DIVERS.&CONTROL/BAC.251**				
NAS_MBY	n a	Bilingual	2 + 1	S1	12
Envelope of gram positive and gram negative rods. Growth of bacteria, replication of the					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
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 the natural environment (soil, water and air), associated with humans, animals, plants, and those of importance in foods and in the water industry. **Prerequisite:** [MBY161 GS]					
MBY261	**GROWTH_ACT.&_CONTROL/FUNGI_261**				
NAS_MBY	n a	Bilingual	2 + 1	S2	12
Organization 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 biotechniology. **Prerequisite:** [MBY161]					
MBY351	**STRUCT.&_DIVERS.OF_VIRUSES_351**				
NAS_MBY	n a	Bilingual	2 + 1	S1	18
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. **Prerequisites:** [BCM251] and [CMY127] and [MBY161]					
MBY352	**ENVIRONMENTAL_MICROBIOLOGY_352**				
NAS_MBY	n a	Bilingual	2 + 1	S1	18
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, organization 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. **Prerequisite:** [MBY161]					
MBY353	**VERTIBRATE-MICROBE_INTERAC.353**				
NAS_MBY	n a	Bilingual	2 + 1	S1	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.					
MBY354	**STRUCT.&_DIVERS.OF_VIRUSES_354**				
NAS_MBY	n a	Bilingual	2 + 1	S1	9
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.					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
Prerequisites: [BCM251] and [CMY127] and [MBY161]					
MBY361	**INDUSTRIAL_MICROBIOLOGY_361**				
NAS_MBY	n a	Bilingual	2 + 1	S2	18
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]					
MBY362	**FOOD_MICROBIOLOGY_362**				
NAS_MBY	n a	Bilingual	2 + 1	S2	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	**MOLEC._BIOL.OF_PROKARYOTES_363**				
NAS_MBY	n a	Bilingual	2 + 1	S2	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 and modifications of proteins: allosteric control, covalent modifications, posttranslational control by compartmentalization. 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	**GENE.MANIPULATION/MICROBES.364**				
NAS_MBY	n a	Bilingual	2 + 1	S2	18
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 end and different ligation strategies. Direct and indirect methods for the identification of recombinant organisms. Characterization (polymerase chain reaction, nucleic acid sequencing) and mutagenisis of cloned DNA fragments. Gene expression in Gram negative (E.coli) Gram positive (B.subtilis) and yeast cells (S.cerevisea). Use of Agrobacterium and baculoviruses for gene expression in plant and insect cells respectively. Applications in protein engineering, diagnostics and synthesis of useful products. **Prerequisites:** [BCM251] and [CMY127] and [MBY161]					
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,					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
electronic, mechanical and civil engineering systems. Introduction to computer aided drawing of components including: crosshatching, dimensioning and detailing. Machine elements including v-belt, gears, shafts, bearings and lubrication, couplings, brakes, cams and eccentrics.					
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.					
MTT210	**FURNITURE_&_TEXTILE_HISTORY_210**				
NAS_VBR	MTT251,252	Bilingual	3 + 0	S1	8
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 French Revolution.					
MTT220	**FURNITURE_&_TEXTILE_HISTORY_220**				
NAS_VBR	MTT261,262	Bilingual	3 + 0	S2	8
Influences of ideologies, social institutions and technology on the development of Western and other material cultures, especially regarding furniture and textiles. Style periods during the nineteenth and twentieth century including the present. **Prerequisite:** [MTT210 GS]					
OBG110	**PRINCIPLES_OF_DESIGN_110**				
NAS_VBR	OBG151,152	Bilingual	2 + 1	S1	12
Practical application of design principles in interior planning and design, foods, clothing. Color theories.					
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.)					
OBS156	**BUSINESS_MANAGEMENT_156**				
EB_OBS	n a	Bilingual	3 + 0	K2	5
A brief introduction to business management which includes a description of a business enterprise and its environments and stake holders; the business person's task in establishing a business, and the obtaining of finance; the general management principles which are used to manage the whole enterprise and its different functions in order to ensure competitiveness.					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
OBS210	**BUSINESS_MANAGEMENT_210**				
EB_OBS	n a	Bilingual	3 + 0	S1	16
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. Methods of transport and transport costs, types and costs of warehousing, electronic aids in materials handling, cost and price dequarterination of purchases, organizing for logistics management, methods for improving logistics performance.					
OBS310	**BUSINESS_MANAGEMENT_310**				
EB_OBS	n a	Bilingual	4 + 0	S1	20
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. The nature of negotiation preparation for negotiation, negotiating for purposes of climate, creation, persuasive communication, handling conflict and aggression, specialized 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 and development 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, dequarterining 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. General service module available as elective module to some BCom degrees.					
OKW413	**WEED_SCIENCE_413**				
NAS_PGW	OKW451,452	Bilingual	2 + 0.5	S1	14
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. 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.					
OPI250	**EXPER._TRAINING_IN_INDUST._250**				
NAS_VBR	n a	Bilingual	1 + 0	J1	6
Compulsory practical training in the food industry during the second year, approved in consultation with the Head of the Department.					
OPI260	**EXPER._TRAINING_IN_INDUST._260**				

Module	Title				
Fac_Dept	Old code	Language	lpw/ppw	Quarter	Credits
NAS_VBR	n a	Bilingual	1 + 0	J1	6
Compulsory practical training in the food industry during the second year, approved in consultation with the Head of the Department.					
OPI280	**EXPER._TRAINING_IN_INDUST._280**				
NAS_VBR	n a	Bilingual	1 + 0	J1	5
Compulsory practical training in the hospitality or retail industry during the second year, approved in consultation with the Head of the Department.					
OPI380	**EXPER._TRAINING_IN_INDUST._380**				
NAS_VBR	n a	Bilingual	1 + 0	J1	5
Compulsory practical training in the hospitality or retail industry during the third year, approved in consultation with the Head of the Department.					
OPI401	**EXPER._TRAINING_IN_INDUST._401**				
NAS_VBR	n a	Bilingual	1 + 0	J1	10
Compulsory practical training in the food industry during the module of two years, as dequarterined by the Head of the Department.					
OPI402	**EXPER._TRAINING_IN_INDUST._402**				
NAS_VBR	n a	Bilingual	1 + 0	J1	2
Compulsory practical training in the hospitality industry during the module of two years, as dequarterined by the Head of the Department.					
OPI450	**EXPER._TRAINING_IN_INDUST._450**				
NAS_VBR	n a	Bilingual	1 + 0	J1	10
Compulsory practical training in the food industry during the fourth year, approved in consultation with the Head of the Department.					
OPI480	**EXPER._TRAINING_IN_INDUST._480**				
NAS_VBR	n a	Bilingual	1 + 0	J1	10
Compulsory practical training in the hospitality or retail industry during the fourth year, approved in consultation with the Head of the Department.					
PGB401	**PROJ.HOSPITALITY_MANAGEMNT_401**				
NAS_VBR	n a	Bilingual	4 + 0	J1	6
Project applicable to the school situation. The theoretical and practical aspects of teaching Hotel-keeping and Catering will be covered. Industry exposure and practical involvement is an essential ingredient of this module.					
PGB402	**PROJ.HOSPITALITY_MANAGEMNT_402**				
NAS_VBR	n a	Bilingual	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.					
PGB480	**PROJECT:HOSPITALITY_MANAG._480**				
NAS_VBR	PGB451,461	Bilingual	4 + 0	J1	24
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.					
PGW350	**SOIL_WATER_RELA.&_IRRIGAT._350**				
NAS_PGW	PGW351,352	Bilingual	2 + 0.5	S1	16
Quantitative description and measurement of soil water content and potential as well as saturated and unsaturated hydraulic conductivity. Modeling water flow in soil (Darcy's law, Richards's equation). Infiltration, redistribution, evaporation, runoff and percolation. Irrigation in South Africa. Modeling 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					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
a field trip to an irrigation scheme.					
PGW361	**EXPERIMENTAL_DESIGN_&_ANAL.361**				
NAS_PGW	PGW421	Bilingual	2 + 0.5	S2	14
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	**SEMINAR_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	**SEMINAR_401**				
NAS_PGW	PGW401	Bilingual	1 + 0	J1	16
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.					
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 module follows after PHY101 and together they are equivalent to the PHY171 module. Kinematics of a point, relativistic kinematics, dynamics of particles, rotation and dynamics of rigid bodies, simple harmonic motion, electrostatics, electrodynamics, elementary alternating current. 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:** [PHY101]					
PHY131	**GENERAL_PHYSICS_131**				
NAS_PHY	n a	Double	4 + 1	S1	16
This module 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]					
PHY171	**FIRST_MODULE_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 module 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					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
Centre. **Prerequisite:** [Par 1.2]					
PHY251	**GENERAL_PHYSICS_251**				
NAS_PHY	n a	English	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] and [WTW211 #] and [WTW218 #]					
PHY252	**MODERN_PHYSICS_252**				
NAS_PHY	n a	English	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 and PHY102] and [PHY251 #] and [WTW211 #] and [WTW218 #]					
PHY261	**CLASSICAL_PHYSICS_261**				
NAS_PHY	n a	English	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	**PHYS_OF_MATER.&RENEW.ENER_262**				
NAS_PHY	n a	English	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_MECH_&_MODELLING_351**				
NAS_PHY	n a	English	4 + 2	K1	18
Quantum mechanics: Wave function, probability interpretation, expectation values, Schrödinger equation, postulates of quantum mechanics, matrix formalism, momentum representation, applications. Modeling physics: numerical solutions and simulations. **Prerequisites:** [PHY251 #] and [PHY252 #] and [PHY261 GS] and [PHY262 GS] and [WTW220 GS] and [WTW221 GS]					
PHY352	**SOLID_STATE_PHYS.&_OPTICS_352**				
NAS_PHY	n a	English	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]					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
PHY353	**PHYSICS_PROJECT_353**				
NAS_PHY	n a	English	0 + 3	S1	12
A student is required to complete a project under guidance of the lecturer. The nature of the project is dequarterined jointly by the student, lecturer and the Head of Department. Requirement: Admission only with the approval of the Head of Department and lecturer involved. Cannot be used as substitute for other Physics 300 modules to obtain admission to the BSc(Hons) in Physics. **Prerequisite:** [TDH]					
PHY361	**ELECTROMAGNET_&_ELECTRONIC_361**				
NAS_PHY	n a	English	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	n a	English	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	n a	English	0 + 3	S2	12
A student is required to complete a project under guidance of the lecturer. The nature of the project is dequarterined jointly by the student, lecturer and the Head of Department. Requirement: Admission only with the approval of the Head of Department and lecturer. Cannot be used as substitute for other Physics 300 modules to obtain admission to the BSc(Hons) in Physics. **Prerequisite:** [TDH]					
PLG251	**INTRO._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_PLANTPATHOLOGY_351**				
NAS_MBY	PLG220	Bilingual	2 + 1	S1	18
Fundamental principles of plant diseases as well as socio-economic importance thereof. The different types of diseases and their symptomatology. Biology and life cycles of selected diseases caused by fungi, bacteria, viruses and nematodes. Plant disease diagnosis.					
PLG363	**PLANT_DISEASE_CONTROL_363**				

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
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 chemo-therapy: characteristics, mode of action and application of fungicides, bactericides and nematicides. Principles of integrated pest and disease management.					
PLG364	**HOST_PATHOGEN_INTERACTIONS_364**				
NAS_MBY	PLG351	Bilingual	2 + 1	S2	18
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.					
PLG461	**NURSERY_&_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_SYS.251**				
NAS_PGW	PPK210	Bilingual	2 + 0.5	S1	12
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
Industrial science and management of production systems and feeding systems in poultry production units. 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	**RURAL_HOUSEHOLD_DEVELOPM._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	**RURAL_HOUSEHOLD_DEVELOPM._264**				
NAS_VBR	n a	Bilingual	1 + 2	S2	10

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
Rural households as contributors to development. Household economy and development. Practical application through analysis of case studies/small PRA projects.					
RHD351	**RURAL_HOUSEHOLD_DEVELOPM._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. **Prerequisite:** [RHD264]					
RHD480	**RURAL_HOUSEHOLD_DEVELOPM._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_DEVELOPM._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
Theriogenology, 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 dequarterination of gestation. **Prerequisite:** [RPL310]					
SCE170	**RELIGIOUS_INSTRUCTION_170**				
unk_unk	n a	Bilingual	1 + 0	J1	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.					
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. Introduction to the periodic table. Chemical composition. Introduction to chemical reactions. Types of chemical reactions, chemical reactions in aqueous solutions. Calculations based on chemical reaction equations. Modern atomic theory. Chemical bonding. Physics: Use of mathematics in physics (vectors, trigonometry). Kinematics of a particle with constant acceleration in 1 dimension. Kinematics of a particle with constant acceleration in 2 dimensions. Concept of a force. Newton's first law of motion. Newton's second law of motion. Newton's third law of motion. Types of forces. Circular motion. Fluids.					
SCI152	**PROBLEM_SOLVING_SKILLS_152**				
NAS_SCI	n a	English	0 + 1	S1	12
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**				

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
NAS_SCI	n a	English	0 + 1	K1	6
Goals and action plans, time management, taking notes, mind maps, technique for writing exams, personal CV.					
SCI154	**EXPLORING_THE_UNIVERSE_154**				
NAS_SCI	n a	English	4 + 0	S1	16
This module 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 dequarterined by stars? Echo's from ancient firmaments - the astronomy of old civilizations. 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! Exotica like pulsars and black holes.					
SCI160	**NATURAL_SCIENCE_160**				
NAS_CMY	n a	English	6 + 1	S2	12
Chemistry: Gases. Liquids and solids. Solutions. Acids and bases. Chemical equilibrium. Redox reactions and electrochemistry. Introduction to organic chemistry. Physics: Equilibrium of a particle and a fixed body. Work. Energy and Power. Momentum. Theory of Heat. Electrostatics. Electric current. Electric circuits. **Prerequisite:** [SCI150]					
SCI162	**PROBLEM_SOLVING_SKILLS_162**				
NAS_SCI	n a	English	0 + 1	S2	12
Computer modeling of scientific problems using spread sheets and data bases. **Prerequisites:** [CIL171] and [CIL172] and [SCI152] or [TDH]					
SCI163	**BASIC_RESEARCH_SKILLS_163**				
NAS_SCI	n a	English	0 + 1	K3	6
Scientific discoveries, the scientific method, scientific publications, ethics of science.					
SCI164	**EXPLORING_THE_UNIVERSE_164**				
NAS_SCI	n a	Afrikaans	4 + 0	S2	16
This module is presented in Afrikaans 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 dequarterined by stars? Echo's from ancient firmaments - the astronomy of old civilizations. 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! Exotica like pulsars and black holes.					
SEM180	**SEMINAR_180**				
NAS_VBR	SEM161,481	Bilingual	2 + 0	S2	6
Analytical approaches to the exploration of sources of scientific information to compile technically correct written scientific assignments. Professional orientation. Use of media.					
SEM361	**SEMINAR_361**				
NAS_VBR	n a	Afrikaans	3 + 0	K3	4
Principles of research methodology. **Prerequisite:** [SEM161]					
SEM362	**SEMINAR_362**				

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
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]					
SEM380	**SEMINAR_380**				
NAS_VBR	SEM161	Bilingual	2 + 0	S2	6
Introduction to research methodology. The compilation of a well structured literature review. **Prerequisite:** [SEM180]					
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 introduction 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 introduction 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_THEO.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 pschycosocial 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					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
person, and philosophy of science, as well as their contribution towards understanding and explaining human behaviour within contemporary contexts. **Prerequisites:** [SLK151] and [SLK152]					
SLK253	**DEVELOPMENT_PSYCHOLOGY_253**				
GW_SLK	n a	Double	2 + 0	K2	10
In this module, the areas and dequarterinants 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(1)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	**CHILD_PSYCHOPATHOLOGY_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. Quarterinology, definitions of abnormal behaviour, problems in diagnosis, labeling, 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					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
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_PSYC.IN_PRACTICE_354**				
GW_SLK	n a	Double	0 + 2	S1	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. Requires SLK 251, 253 OPV 251 **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 utilization of available resources during psychological assistance. **Prerequisites:** [SLK251] and [SLK352] and [Closed: needs departmental permission]					
SOC151	**SOCIAL_ORGANISAT.&_INDIVID.151**				
GW_SOC	n a	Bilingual	3 + 0	K1	6
An introduction to sociology and the sociological paradigm.					
SOC152	**SOCIAL_INSTITUTIONS_152**				
GW_SOC	n a	Bilingual	3 + 0	K2	6
A focus on the social dynamics of the institutions of society such as family, the economy, government, the state and civil society.					
SOC259	**HOUSEHOLDSFAMILY_&_GENDER_259**				
GW_SOC	SOC252	English	3 + 1	K3	10
This module focuses on theories and issues relevant to the understanding of gender, households and family life at a general level but with a particular emphasis on the Southern African context. The module will address issues such as poverty, survival strategies of rural and urban households. HIV/Aids and its effects on family life and domestic violence.					
STK110	**STATISTICS_110**				
NAS_WST	n a	Double	3 + 1	S1	13
Descriptive Statistics – Univariate: 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. **Prerequisite:** [Reg1.2(j)]					
STK120	**STATISTICS_120**				
NAS_WST	n a	Double	3 + 1	S2	13
Multivariate statistics: Analysis of variance, categorical data analysis, distribution-fee 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).					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
Marginal- and total functions. Stochastic and dequarterinistic 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. **Prerequisite:** [STK110 GS]					
STK210	**STATISTICS_210**				
NAS_WST	n a	Double	3 + 1	S1	20
Probability theory. Univariate probability distributions, expected values and moments. Special probability distributions: Binomial, hypergeometric, poison, 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. **Prerequisites:** [STK110] and [STK120]					
STK281	**STATISTICS_281**				
NAS_WST	n a	English	3 + 1	S2	10
Applied regression analysis: Simple and multiple regression, non-linear 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. **Prerequisites:** [STK110] and [STK120]					
SUR220	**SURVEYING_220**				
NAS_GGY	n a	English	3 + 1	S2	16
Definition of Surveying. Adjustment and use of the following instruments: Level, compass and theodolite. Site surveying, leveling and tacheometry. Co-ordinate systems, angles of direction, joins and polars. Point positioning. Trigonometric height dequarterination. **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 scalar moments. Relationship between scalar- and vector moments. Couples. equivalent force systems on rigid bodies. Resultants of forces 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.					
SWK210	**STRENGTH_OF_MATERIALS_210**				
ING_ING	n a	Bilingual	3 + 2	S1	16
Stresses, strains and material behaviour: Normal and shear stresses, factors and safety. Bar structures with axial loads: Displacements and stresses of statically dequarterinate and indequarterinate structures, thermal effects, transformation of stress, strain energy, dynamic loads. Torsion: Torsion of round bars, transformation of shear stress, relationship between E, G, y, transmission of power, statically indequarterinate axles, strain energy. Shear and bending of beams: Shear force and bending moment, strains and stresses. Analysis of stress and strain: Plane stress, tri-axial stress, 3D stress, plane strain. Deflections of beams. Buckling.					
TBE151	**TOURISM_MANAGEMENT_151**				
EB_TBE	n a	Bilingual	4 + 0	K1	5
Structure and organization of the tourism industry: This introductory module provides an introduction to and overview of the tourism industry. Firstly definitions and concepts are					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
explored, where after the evolution of tourism through the ages is addressed. With a sound frame of reference in place, the structure and organization of tourism at the international, national, provincial and private sector levels, is examined.					
TBE152	**TOURISM_MANAGEMENT_152**				
EB_TBE	n a	Bilingual	4 + 0	K2	5
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, their relationships and their interdependence. Specific attention is placed on key components such as attractions, transportation, distribution channels, hospitality and related services.					
TBE161	**TOURISM_MANAGEMENT_161**				
EB_TBE	n a	Bilingual	4 + 0	K3	5
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.					
TBE162	**TOURISM_MANAGEMENT_162**				
EB_TBE	n a	Bilingual	4 + 0	K4	5
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.					
TBE261	**TOURISM_MANAGEMENT_261**				
EB_TBE	n a	Bilingual	4 + 0	K3	8
The management of tourism attractions: In this module the aspect of 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, where after 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.					
TBE262	**TOURISM_MANAGEMENT_262**				
EB_TBE	n a	Bilingual	4 + 0	K4	8
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.					
TBE361	**TOURISM_MANAGEMENT_361**				
EB_TBE	n a	Bilingual	4 + 0	K3	10
Hospitality management 1 - Rooms division and front office 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					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
front office and its support units.					
TBE362	**TOURISM_MANAGEMENT_362**				
EB_TBE	n a	Bilingual	4 + 0	K4	10
Hospitality management 2 - Food and beverage and financial 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 organization, the second part of this module covers all the policies, principles and procedures pertaining to financial operations and financial management in such establishments.					
TKS210	**TEXTILES_210**				
NAS_VBR	TKS251,252	Bilingual	3 + 1	S1	14
Utility aspects: basic components of textiles, consumer decision making, utility aspects that include durability, comfort, maintenance, health/safety/protection and aesthetic aspects. Fibres and yarns: 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, compound and novelty yarns).					
TKS211	**TEXTILES_211**				
NAS_VBR	TKS251	Bilingual	3 + 1	K1	7
Utility aspects: basic components of textiles, consumer decision-making, utility aspects that include durability, comfort, maintenance, health/safety/protection and aesthetic aspects.					
TKS220	**TEXTILES_220**				
NAS_VBR	TKS261,262	Bilingual	3 + 1	S2	14
Fabric structures: Introduction to fabric structures. Woven fabrics, knits, non-woven fabrics and compound fabrics. Finishes and dying processes: 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:** [TKS210]					
TKS221	**TEXTILES_221**				
NAS_VBR	TKS263	Bilingual	0 + 1	S2	6
Project: Project to assess performance properties of textiles for specific end-use by using laboratory tests. A written report of the results is also required. **Prerequisite:** [TKS220 GS]					
TKS310	**TEXTILES_310**				
NAS_VBR	TKS362	Bilingual	2 + 0	S1	6
New developments (apparel and interior textiles). **Prerequisite:** [TKS220 GS]					
TKS361	**TEXTILES_361**				
NAS_VBR	n a	Bilingual	2 + 0	K3	3
Technical textiles (Interior design students). **Prerequisite:** [TKS220 GS]					
TKS420	**TEXTILES_420**				
NAS_VBR	TKS451,452	Bilingual	3 + 0	S2	8
Choices and purchasing: standards, quality recognition and sources of information. Handling and care: General, consumer practices; sources of information. **Prerequisites:** [TKS210] and [TKS220] and [TKS221]					
TLR320	**LIVESTOCK_BREEDING_320**				

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
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:** [GTS261]					
TLR411	**LIVESTOCK_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, hybridisation 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	**LIVE_STOCK_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 dequarterination by leveling, 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.					
VAP300	**VETERINARY_ANATOMY_AND_PHYSIOLOGY_300**				
NAS_VET_PAS	n a	English	10 + 2	J1	72
Comparative anatomy, physiology, histology and embryology of the skin, locomotor system, nervous system, cardiovascular system, respiratory system, digestive system and urogenital system of the domestic animals. Topographical anatomy of the domestic animals. **Prerequisite:** [Only students selected for BSc(Veterinary Biology)III]					
VBF410	**CONSUMER_FACILITATION_410**				
NAS_VBR	VBF451,452	Bilingual	3 + 0	S1	8
Consumer decision making through the family life cycle; dequarterinants of consumer satisfaction. Consumer education; development of consumer skills; less privileged consumers. Expenditure patterns of the diverse SA consumer market. Consumerism. Globalism.					
VBM400	**SUBJ_DID:BUSINESS_MANGEMNT_400**				
NAS_VBR	n a	Bilingual	2 + 1	J1	24
Basic principles of community nutrition. Nutritional assessment. Nutrition problems and					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
programmes in South African communities.					
VDB320	**FOOD_SERVICE_MANAGEMENT_320**				
NAS_VBR	VDB361,362	Bilingual	4 + 1	S2	20
Planning and layout of food service units for different food service systems. Equipment for food services. Factors influencing the choice and purchasing of equipment for different food service units. Hygiene and safety in food services. Principles of management as applied to food service systems. Human Resource Management in food service systems. Financial management in food services. **Prerequisite:** [VDS320 #]					
VDB361	**FOOD_SERVICE_MANAGEMENT_361**				
NAS_VBR	n a	Bilingual	4 + 1	K3	10
Planning and layout of food service units for different food service systems. Equipment for food services. Factors influencing the choice and purchasing of equipment for different food service units. Hygiene and safety in food services.					
VDB362	**FOOD_SERVICE_MANAGEMENT_362**				
NAS_VBR	n a	Bilingual	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.					
VDB410	**FOOD_SERVICE_MANAGEMENT_410**				
NAS_VBR	VDB451,452	Bilingual	3 + 1	S1	16
The professional food service manager's roles, responsibilities and characteristics. Contemporary leadership and management styles in food service systems. Professionalism and ethics. Advanced food service systems and production management techniques. Marketing of food services. **Prerequisite:** [VDB320]					
VDB411	**PROJECT_FOOD_SERVICE_MANAG_411**				
NAS_VBR	VDB453	Bilingual	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 module work. **Prerequisite:** [VDB410 #]					
VDG212	**NUTRITION_212**				
NAS_VBR	VDG163,251,252,253,254	Bilingual	4 + 1	S1	10
Physiological principles of nutrition. Recommended dietary allowances. The study of nutrients regarding their sources, functions, metabolism, and symptoms of deficiency and toxicity. Dietary recommendations and guidelines. Energy metabolism. The theory of menu and meal planning. **Prerequisite:** [KEP220]					
VDG220	**NUTRITION_220**				
NAS_VBR	VDG163	Bilingual	3 + 0	S2	8
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_VKU	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) and digestion physiology. Applications are made regarding man and animals.					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
Practical work: Experimental work and problem orientated tasks. **Prerequisite:** [CMY127]					
VDG255	**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	**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.					
VDG310	**NUTRITION_310**				
NAS_VBR	VDG211,251,252,253,254	Bilingual	3 + 1	S1	14
The study of nutrients and water regarding their chemical composition, characteristics, basic digestion, absorption, metabolism, functions, food sources and symptoms of deficiency and toxicity. Energy metabolism. Dietary recommendations and guidelines, dietary guides and meal planning. The use and application of food composition tables in dietary analysis. **Prerequisites:** [FSG110 or VDG220] and [FSG120 or VDG163]					
VDG320	**NUTRITION_320**				
NAS_VBR	VDG361,362	Bilingual	3 + 1	S2	14
The role of nutrition in the life cycle. 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. **Prerequisite:** [VDG310]					
VDG363	**NUTRITION_363**				
NAS_VBR	n a	English	3 + 1	K3	10
The role of nutrition in the life cycle. **Prerequisites:** [VDG255] and [VDG256]					
VDG483	**NUTRITION_483**				
NAS_VBR	n a	English	3 + 0	S1	20
Basic principles of community nutrition. Nutritional assessment. Nutrition problems and programmes in South African communities. **Prerequisites:** [KEP261] and [KEP262] and [VDG255] and [VDG256] and [VDG363]					
VDS110	**FOODS_110**				
NAS_VBR	VDS151,152	Bilingual	3 + 0	S1	8
Global food production and supply. Global food shortages and food aid programmes. Food legislation. Additives. Food labeling. Consumer rights and consumer protection.					
VDS210	**FOODS_210**				
NAS_VBR	VDS251,252	Bilingual	3 + 1	S1	16
The study of different food systems with regard to food preparation. Physical and chemical properties and the influence of the composition in food preparation. Weighing and measuring techniques, equipment and quarterinology as applied in food preparation. Food preparation basics of the following: soups and sauces; fruit and vegetables; salads; frozen desserts; gelatine.					
VDS221	**FOODS_221**				
NAS_VBR	VDS261,262	Bilingual	3 + 1	S2	16
The composition and physical properties, as well as the factors that influence the preparation of the following: meat, poultry, fish, legumes, eggs and milk, starches and					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
cereals; baked products (whole spectrum); leavening agents. **Prerequisite:** [VDS210]					
VDS310	**FOODS_310**				
NAS_VBR	VDS351,352	Bilingual	3 + 1	S1	16
Planning executing and reporting consumer food research. Consumer sensory evaluation techniques. Experiments in food, emphasizing 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:** [VDS210] and [VDS221]					
VDS320	**FOODS_320**				
NAS_VBR	VDS361	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:** [KEP220] and [KEP261] and [VDS220] and [VDS221]					
VDS321	**FOODS_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:** [VDS210] and [VDS221]					
VDS353	**FOODS_353**				
NAS_VBR	n a	Bilingual	3 + 1	K1	8
Principles and implementation of household food preservation techniques: drying, fermentation, canning, chilling and freezing, as well as other relevant food preservation trends. **Prerequisites:** [VDS220] and [VDS221]					
VDS354	**FOODS_354**				
NAS_VBR	n a	Bilingual	3 + 0	K2	4
Principles of food safety and food hygiene.					
VDS363	**FOODS_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]					
VDS413	**FOODS_413**				
NAS_VBR	VDS451,452	Bilingual	3 + 1	S1	24
Recipe development process. Development of appropriate recipes and food products for a given situation. Standardization of recipes. Food styling and food photography. **Prerequisite:** [VDS310]					
VDS414	**CULINARY_ART_414**				
NAS_VBR	VDS453,454	Bilingual	2 + 1	S1	14
Advanced food preparation and presentation techniques with regard to: starters, side dishes, soups, sauces and stocks, baked and confectionary products, desserts.. **Prerequisites:** [VDS210] and [VDS221]					
VDS415	**VISUAL_MERCHANDIS.OF_FOODS_415**				

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
NAS_VBR	VDS455,456	Bilingual	3 + 0	S1	8
Aspects of food retailing with special emphasis on food packaging and labeling of food products. Aspects of food retailing with regard to display, presentation and shop layout as applied to food products.					
VDS422	**PROJECT_FOODS_422**				
NAS_VBR	VDS463	Bilingual	1 + 2	S2	20
Research methodology. Planning, executing and reporting a research project in a food related field. **Prerequisites:** [VDS310]					
VDS423	**FOODS_423**				
NAS_VBR	VDS461	Bilingual	3 + 0	S2	8
Factors influencing food consumption, consumer behaviour and food choice. Food product advice. Consumer advice, marketing of food products, consumer education.					
VDS424	**CULINARY_ART_424**				
NAS_VBR	VDS464,465	Bilingual	2 + 1	S2	14
Advanced food preparation and presentation techniques with regard to: meat, poultry, fish and shellfish. Event planning and banqueting. **Prerequisites:** [VDS210] and [VDS221] and [VDS414]					
VDS425	**PROJECT_FOODS:VISUAL_MERCH.425**				
NAS_VBR	VDS462	Bilingual	3 + 0	S2	6
Practical application of theoretical principles of visual merchandising of food and consumer aspects in food retailing. **Prerequisites:** [VDS415] and [VDS423 #]					
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	**NUTRITION_SCIENCE_411**				
NAS_VKU	n a	English	4 + 0	S1	18
Specialized nutrition of monogastric animals: poultry, pigs, horses and selected freshwater aquatic organisms. The use of computer systems in feeding management. **Prerequisite:** [VGE301]					
VGE421	**NUTRITIONAL_SCIENCE_421**				
NAS_VKU	n a	English	3 + 0	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. Nutrition of the race horse and working horse Practical work: Formulation of lowest cost rations and practical work with animals. **Prerequisite:** [VGE301]					
VGE423	**NUTRITION_SCIENCE_423**				
NAS_VKU	n a	English	3 + 0	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 quarter of requirements and least cost formulations, specialized assignments and on-farm					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
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 organization. Examples of theme study from the secondary school level.					
VHK310	**DIDACTICS:HOME_ECONOMICS_310**				
NAS_VBR	n a	Bilingual	4 + 1	S1	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	**SUBJECT_DIDACTICS:HOME_ECON400**				
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:** [VHK310]					
VHS262	**DIDACT:HOTELK_&_CATERING_262**				
NAS_VBR	n a	Bilingual	0 + 1	K4	6
The study field of Didactics: Hotel keeping and Catering: Introduction, goals, lesson structure, methodological principles, practical and laboratory organization. Examples of theme study on secondary school syllabus.					
VHS310	**DIDACT:HOTELK._&_CATERING_310**				
NAS_VBR	n a	Bilingual	4 + 1	S1	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	**DIDACT:HOTELK.&_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:** [VHS310]					
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_SCI.PHARMACOLOGY_411**				
NAS_VKU	n a	Afrikaans	3 + 0	S1	12
The pharmacology, laws, control and use of substances for animal production. **Prerequisites:** [DFS320] and [VGE301]					
VKK155	**FOUNDATION_OF_VISUAL_LANG.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					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
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_&_ANTI-STYLE_1940-PRES.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_&_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	**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. Stock science. Practical work includes the introduction to general care and handling of farm stock.					
VKU211	**ANIMAL_SCIENCE_211**				
NAS_VKU	n a	English	2 + 0.5	S1	6
General principles of breeding of farm stock, viz. large stock, small stock, poultry and pigs. Heredity and race improvement.					
VKU220	**ANIMAL_SCIENCE_220**				
NAS_VKU	n a	English	2 + 0.5	S2	12
Animal production systems. Stock farming regions of South Africa. Introduction to the basic principles and quarterinology of large stock, small stock, pig and poultry production systems. Practicals include the general caring and handling of farm animals. **Prerequisite:** [VKU210]					
VKU221	**ANIMAL_SCIENCE_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	**ANIMAL_SCIENCE_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.					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
Intensive and extensive feeding.					
VKU361	**ANIMAL_ECOLOGY_361**				
NAS_VKU	VNE310	Bilingual	2 + 0	S2	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_SCI._BIOTECHNOLOGY_362**				
NAS_VKU	n a	Bilingual	1 + 0.5	S2	8
Application of biotechnology in farm animals with specific reference to reproductive biotechnology such as AI MOET and sex manipulation, which has an effect on genetic progress. Application of DNA-technology such as parentage verifications, identification of genetic defects, QTL's and MAS. **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]					
VLG310	**EXTENSION_310**				
NAS_VBR	VLG351,352	Bilingual	1 + 2	S1	12
Principles and procedures of adult education. Development of media. Demonstrations and presentation methods. **Prerequisite:** [Fourth-year status]					
VLG320	**EXTENSION_320**				
NAS_VBR	VLG361,362	Bilingual	1 + 2	S2	12
Community development. Initiation of and participation in community development projects. **Prerequisite:** [VLG310 GS]					
VSX420	**MEAT_AND_DAIRY_SCIENCE_420**				
NAS_VKU	n a	Afrikaans	2 + 0	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	3 + 1	S1	18
The science of food for lifestyles - sport nutrition, nutrition for prevention of disease.					
VVW361	**LEGIS&LABEL/ANI&HUMAN_FOOD_361**				
NAS_VDW	n a	Bilingual	2 + 1	S2	18
National and international standards, Codex Alimentarius, FDA. Application of food legislation at the consumer level.					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
VVW362	**COMMUNICATION_IN_NUTRITION_362**				
NAS_VDW	n a	Bilingual	2 + 1	S2	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	**COM.NUTRITION_&PUBL.HEALTH_363**				
NAS_VDW	n a	Bilingual	2 + 1	S2	18
The theory and practice of community nutrition and public health. Dietary supplementation, enrichment and fortification.					
VWP410	**PROJECT:_HOME_ECONOMICS_410**				
NAS_VBR	n a	Bilingual	2 + 2	S1	26
Planning and execution of the production of a food, clothing or interior product as applicable for the school syllabus. Application of entrepreneurial and marketing principles.					
VWP411	**PROJECT:HOTELK.&_CATERING_411**				
NAS_VBR	n a	Bilingual	0 + 2	S1	18
Planning and execution of a community education project.					
WDE210	**VELD_MANAGEMENT_PRACTICES_210**				
NAS_PGW	WDE271,272	English	2 + 0.5	S1	12
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. Management practices for sustainable animal production from natural pastures. This will enable the student to advise farmers on different management systems and practices.					
WDE250	**PRINCIPLES_OF_VELD_MANAGM._250**				
NAS_PGW	WDE251,252	Afrikaans	2 + 0.5	S1	12
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. 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.					
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	**EVAL._OF_RANGE_&_FORAGES_450**				
NAS_PGW	WDE421	Bilingual	3 + 0	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					

Module	Title				
Fac_Dept	Old code	Language	lpw/ppw	Quarter	Credits
management strategies.					
WDE460	**PROD_SYS_V1:INT/PLA&ANIMPRO_460**				
NAS_PGW	WDE483	English	2 + 0.5	S2	12
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	**TURFGRASS_MANAGEMENT_461**				
NAS_PGW	WDE412	Bilingual	2 + 0.5	S2	14
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 module concentrates on the identification of suitable species, their establishment and maintenance requirements. Particular emphasis is placed on the identification and solving of problems.					
WDE470	**EVAL._OF_RANGE_&_FORAGES_470**				
NAS_PGW	WDE424	English	3 + 0	S1	10
Capita selecta form Evaluation of Range and Forages 450.					
WDE481	**VELD_MANAGEMENT_481**				
NAS_PGW	WDE451,452	English	2 + 0.5	S1	12
The development of veld management strategies through the integration of ecological and physiological principles with economic and sociological limitations, in order to achiever production objectives, while ensuring the reclamation and conservation of natural resources. Identification of adapted fodder crops and pastures (including grass, leguminous plans, 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.					
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. Sunshine variability. The boundary layer. 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 South African Weather Bureau: Composition and submission of a report.					
WKD152	**ATMOSPHERIC_CIRC.&_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 force. Pressure gradient force. Coriolis force. 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_&_MESOSCALE_METEO.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					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
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	**DYNAM.&_NUMER._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 lev el. Equations for the pressure gradient and Coriolis forces. Introduction to finite difference methods. 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_PRIN._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.					
WKD250	**WEATHER_FORECASTING_250**				
NAS_GGY	WKD251,252	English	5 + 0	S1	24
Plot all coded meteorological messages, analyze surface and upper air synoptic maps. General circulation of the Southern Hemisphere. Synoptic weather systems over South Africa. Basic principles and interpretation of satellite imagery. Interpretation of aero logical diagrams, dynamic and thermodynamic variables. Integration of information to describe the current state of the atmosphere.					
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 Clausuis-Claperon equation. Calculation of the wet adiabat.					
WKD262	**CLIMATE_DATA_MANIPULATION_262**				
NAS_GGY	n a	English	1 + 0	K4	12
Spatial representation and interpretation of weather data. Introduction to statistical and numerical methods. Obtaining and displaying weather data. Computer programming. Introduction to atmospheric models.					
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	**ATMOSP._VORTIC._&DIVERGENC.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.					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
WKD360	**RESEARCH_PROJECT_360**				
NAS_GGY	WKD363,364	English	5 + 2	S2	36
Literature survey, acquisition and manipulation of data, research report, presentation of research results.					
WKD361	**QUASI-GEOSTROPHIC_ANALYSIS_361**				
NAS_GGY	WKD361	English	4 + 0	K3	18
Tendency and Omega equations. Model of a boroclinic system. Introduction to numerical models.					
WKD362	**CLOUD_&_BOUNDARY_LAYER_DYN.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.					
WKE420	**WILDLIFE_SCIENCE_420**				
NAS_VKU	n a	Afrikaans	2 + 0	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	1 + 0.5	S1	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.					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
Prerequisites: [WST110] and [WST120] and [WTW114 GS or GS] and [WTW126 GS or GS] and [WTW128 GS or 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	Double	4 + 2	S1	36
Matrix methods in Statistics: generalized 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, generalized 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)	Double	2 + 1	S2	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)	Double	2 + 1	S2	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 module includes the syllabus of Calculus 114, as well as enrichment. Enrichment includes computer based modules. Real numbers and the coordinate plane. Functions and their zero's. Polynomials. Exponential and logarithmic functions. Vector algebra. Functions, limits and continuity. Differential calculus of single variable functions, rate of change, graph sketching, optimization 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 module includes the syllabi of Calculus 128 and Linear algebra 126, as well as enrichment. Enrichment includes computer-based modules. This module follows WTW101.					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
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, dequarterinants. Mathematical induction. Complex numbers and factorization of polynomials. (4 lectures, 1 tutorial and 1 computer session) **Prerequisite:** [WTW114 GS or WTW101 GS]					
WTW114	**CALCULUS_114**				
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 module serves as preparation for students majoring in Mathematics (including all students who intend to enroll 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 module also includes a formal technique mastering programme. (4 lectures and 1 tutorial of 3 hours) **Prerequisite:** [Par 1.2]					
WTW115	**DISCRETE_STRUCTURES_115**				
NAS_WTW	n a	Double	2 + 1	S1	8
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]					
WTW123	**NUMERICAL_ANALYSIS_123**				
NAS_WTW	n a	Double	2 + 1	S2	8
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 conv ergence results are treated. (2 lectures and 1 tutorial of 1½ hours) **Prerequisite:** [WTW114 GS or WTW101GS]					
WTW126	**LINEAR_ALGEBRA_126**				
NAS_WTW	n a	Double	2 + 1	S2	8
Vector algebra with applications, matrix algebra, systems of linear equations, the vector space R^n, bases, dequarterinants. Mathematical induction. Complex numbers and factorization of polynomials. Conic sections. This module 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 module also includes a formal technique mastering programme. (2 lectures and 1 tutorial of 1½ hours) **Prerequisite:** [Par 1.2]					
WTW128	**CALCULUS_128**				
NAS_WTW	n a	Double	2 + 1	S2	8
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 surf aces and multivariable functions. This module serves as preparation for students majoring in Mathematics (including all students who					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
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. This module also includes a formal technique mastering programme. (2 lectures and 1 tutorial of 1½ hours) **Prerequisite:** [WTW114 GS or WTW101GS]					
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. (4 lectures, 1 tutorial of 1½ hours and 1 computer session of 1 hour). 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. **Prerequisite:** [Par 1.2]					
WTW152	**MATHEMATICAL_MODELLING_152**				
NAS_WTW	n a	Double	2 + 1	S1	8
Introduction to the modeling 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). WTW152 can also be taken in the second semester. **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 module 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 module 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 R^n, bases, dequarterinants. Mathematical induction. Complex numbers and factorization of polynomials. Conic sections. This module is designed for first year engineering students as well as for 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 module also includes a formal technique mastering programme. (2 lectures and 1 tutorial of 1½ hours) **Prerequisite:** [Par 1.2]					
WTW162	**DYNAMICAL_PROCESSES_162**				
NAS_WTW	n a	English	2 + 1	S2	8
Introduction to the modeling 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) **Prerequisites:** [WTW114 GS or WTW101GS] and [WTW152 GS]					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
WTW168	**CALCULUS_168**				
NAS_WTW	n a	Double	2 + 1	S2	8
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 module 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. This module also includes a formal technique mastering programme. (2 lectures and 1 tutorial of 1½ hours) **Prerequisite:** [WTW114 GS or WTW101 GS or WTW158 GS]					
WTW211	**LINEAR_ALGEBRA_211**				
NAS_WTW	n a	Double	2 + 1	S1	12
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) **Prerequisite:** [WTW126 or WTW102]					
WTW218	**CALCULUS_218**				
NAS_WTW	n a	Double	2 + 1	S1	12
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) **Prerequisites:** [WTW114 or WTW101] and [WTW128 or WTW102]					
WTW220	**ANALYSIS_220**				
NAS_WTW	n a	Double	2 + 1	S2	12
Properties of real numbers. Analysis of sequences and series of real numbers. Power series and theorems of convergence. The Bolzano-Weierstrass theorem and the inquarterediate value theorem. Analysis of real-valued functions on an interval. (2 lectures and 1 tutorial of 1½ hours) **Prerequisites:** [WTW114 or WTW101] and [WTW128 or WTW102]					
WTW221	**LINEAR_ALGEBRA_221**				
NAS_WTW	n a	Double	2 + 1	S2	12
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]					
WTW285	**DISCRETE_STRUCTURES_285**				
NAS_WTW	n a	Double	2 + 1	S2	12
Counting techniques: combinations with repetition, functions. Pigeon-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)					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
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 R^1 and R^n. 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). This module is not presented every year - please consult the Head of Department. **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). This module is not presented every year - please consult the Head of Department. **Prerequisites:** [WTW126 or WTW102] and [WTW218]					
WTW354	**FINANCIAL_ENGINEERING_354**				
NAS_WTW	n a	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:** [WST210] and [WTW211] and [WTW218]					
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:** [WST210] and [WTW211] and [WTW218] and [WTW220] and [WTW286]					
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, factorization 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**				
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). This module is not presented every year - please consult the Head of Department.					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
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_DIFF_EQUATIONS_386**				
NAS_WTW	n a	Bilingual	2 + 1	S2	18
Conservation laws and modeling. 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) **Prerequisite:** [WTW211]					
ZEN161	**ANIMAL_DIVERSITY_161**				
NAS_ZEN	ZEN122	Double	4 + 1	K3	8
Animal classification, phylogeny, organization and quarterinology. 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 + 1	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

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
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	**MAMMALOGY_352**				
NAS_ZEN	n a	English	4 + 2	K1	18
Mammalian origins and their characteristics: origins and characteristics; evolution of african mammals; structure and function: integument, support and movement; foods and feeding; environmental adaptations; reproduction; behaviour, ecology and biogeography, social behaviour; sexual selection, parental care, and mating systems; community ecology; zoogeography; special topics: parasites and diseases, domestication and domesticated mammals, conservation, prescribed reading;					
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 dequarterining community structure; disturbance as a dequarterinant 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 and 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.					

Module	Title				
Fac_Dept	**Old code**	**Language**	**lpw/ppw**	**Quarter**	**Credits**
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	**BEHAVIORAL_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, optimization 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 p.w.) (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: Practical experience with learning opportunities arranged by the Centre for Science Education form part of this module.

(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. Die 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 action research project 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 CERTIFICATES

Sc.9.1 ADVANCED CERTIFICATES IN EDUCATION

SEF 471 Mathematics 471 (28 lectures, 24 h p, 28 hrs of assignments**)**(16, Level 5)
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, economic and entrepreneurial contexts.

SEF 472 First Module in Chemistry 472 (28 lectures, 24 h p, 28 hrs of assignments**)**
(16, Level 5)
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)
Units, vectors, one-dimensional kinematics of a point, relativistic kinematics, dynamics, work, 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)
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)
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 analyze algorithms and processes.
- Obtain, analyze and present data using methods and principles of statistics.
- Knowledge and application of principles and theorems of plane geometry of angles, triangles, circles.

SEF 476 Statistics for teachers476
(16, Level 5)
Probability and inference. Introductory probability theory and theoretical distributions. Sampling distributions. Estimation theory and hypothesis testing of sampling averages and proportions. Optimization techniques with economic applications.

SEF 477 Statistics 477
(24, Level 6)
Sampling methods. Exploratory data analysis. Classification of data, graphical representations, elementary descriptive methods. 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.

SEF 478 Introductory Mathematics 478
(12, Level 5)
Foundations of numeracy and mathematics. Number systems, the number line, numeracy, common and decimal fractions, placeholders, algebra and functional mathematics. Misconceptions and approaches to dealing with them.

SEF 479 Introductory Physical Science for teachers 479
(12, Level 5)
Elementary concepts of measurement of length, volume, mass and density. Forces, moments, levers, mechanical advantage and hydraulics, concepts of equilibrium. Electricity, circuits, resistance and capacitance, some elementary electronics. Motion, including rotation. Heat. Elementary Optics. Elementary atomic structures, the periodic table, elements, bonding and compounds, acids, bases and oxidation. Soils and minerals. Phase changes. DNA proteins, enzymes and cells. Misconceptions and approaches to dealing with them.

SEF 481 Current trends in Mathematics, Science and Technology education 481
(28 lectures, 20hrs of assignments)(16, Level 6)
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)
Basic Internet Skills: The World Wide Web as a source of information and data: Searching the World Wide Web and book marking of sites, Searches of cyberspace for programmes and data, file transfer protocol and obtaining computer and data files from remote sites; email, 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)
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)
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)
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 definition of the need and capacity, matching of networking systems to the needs and resources of a school, and identifying an appropriate choice of technology. 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.

SEF 491 Technology fundamentals 491
(12, Level 6)
The nature of technology. Technology as design. Classes of Technology, EMI framework. The technological process as a system. Life cycles. Effectiveness, efficiency, time, cost, material and environmental, ethical and aesthetic constraints. Principles of ergonomics and safety issues. Technology and culture.

SEF 492 Technology to early senior phase 492
(12, Level 6)
Participants will be exposed to the technological process and be expected to design and fabricate products of technology. Themes addressed include transport systems, food, electrical circuits, drive systems, food and food preservation. Project. Outcomes include planning skills, syllabi and strong principle knowledge of curriculum design for technology.

SEF 493 Technology for middle senior phase 493
(12, Level 6)
Participants will be exposed to the technological process and be expected to design and fabricate products of technology. Themes addressed include structures and access systems, simple machines including levers, hydraulics and pneumatics. Outcomes include planning skills, syllabi and knowledge of the principles curriculum design for technology and principles of assessment. Practical design of phase plans and assessment of actual learning interventions designed and implemented by the participants.

SEF 494 Technology for upper senior phase 494
(12, Level 6)
Participants will be exposed to the technological process and be expected to design and fabricate products of technology. Themes addressed include processing and graphic communication, electronic systems, links with information technology. Project. A cycle of technology learning events will be designed and assessed by participants.

SEF 495 Indigenous technology 495
(6, Level 6)
Issues of culture, aesthetics, ethics, roles, and prior knowledge and conceptions of technology and environment are the focus of this module. Ways of investigating and describing these ways of knowing, and how they impact on technological systems, user views and needs, and learning processes and paradigms of learners will be discussed and discovered, from the point of view of the technology life cycle and systems, as well as from an educational point of view.

SEF 496 Technology project 496
(6, Level 6)
This project is integrated in nature and is a culminating evidential project. This project requires a phase plan, a grade plan for each of the grades, fully developed learning experience for a chosen grade, including task sheets for learners. Assessment instruments, examples of evidence produced by learners of different abilities, assessment decisions and justifications for those learners. A full self-assessment and evaluation including reference to learning theories, features of outcome-based education and the various specific and generic outcomes required by national planners. Evidence of resource use, and an analysis of effective use.

RTS 410 Computer-assisted testing 410 (28l)
Also 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. 29 and G.62.

(a) Admission requirements and prerequisites

(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 BSecEd(Sci) degree and provided that he or she complies with the stipulations for the particular modules as set out in the syllabi descriptions.

(i) The curriculum is compiled in consultation with the head of department, from whom full details may be obtained except if mentioned otherwise.

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

(b) Examinaiton admisison and pass requirements

For preparation, evaluation and examination of essays, 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

The BSc(Hons) degree is awarded with distinction to a candidate that obtains a weighted average of at least 75% in all the prescribed modules and a minimum of 65% in any one module.

(d) Degrees

Disciplines	Degree code
Actuarial Mathematics	02240273
Applied Mathematics	02240171
Biochemistry	03241011
Biotechnology	02240392
Botany	03241091
Chemistry	02240122
Computer Science	02240081
Engineering and Environmental Geology	02240372
Entomology	03241031
Exploration Geophysics	02240351
Food Science	03240921
Genetics	03241051
Geography	02240411
Environmental Analysis and Management	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 modules, other than the honours modules 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 module material extends over at least two semesters for full-time students, while the part-time module extends over at least four semesters.

(c) Curriculum

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

- A common core of three modules, 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 modules already passed may be considered, in which case suitable alternative modules will be prescribed by the Dean in consultation with the relevant head of the department concerned.
- The prescribed module work in the student's field of specialization. Credit for equivalent modules already passed may be considered, in which case suitable alternative modules will be prescribed by the Dean in consultation with the head of the department concerned.
- Additional modules 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 all the prescribed modules, with a minimum of 65 % in the other modules to pass the degree with distinction.

(e) Degrees

Discipline	**Degree code**
Agricultural Economics	03242021
Crop Protection	03242062
Extension	03242011
Food Production and Processing	03242172
Rural Development	03242121

Land-Use Planning	03242051
Plant Production	03242031
Plant Protection	03242061
Plant Quarantine	03242183
Rural Development and Ecotourism	03242152
Rural Development Planning	03242023
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.30 – G.44.

(a) Admission requirements

(i) **MSc degree:** Subject to the stipulations of General Regulations G. 30, G. 1.3 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 modules as may be prescribed. (Where a BSc(Hons) degree is not a prerequisite for admission to the MSc study, additional postgraduate module work is compulsory.)

(c) 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.

(d) Pass requirements

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

(e) 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).

(f) Degrees

Discipline	**Degree code**
Actuarial Mathematics	02250395
Applied Mathematics	02250171
Applied Mineralogy	02250381
Biochemistry	03251011
Biotechnology	03251052
Botany	03251091

Chemistry	02250121
Computer Science	02250081
Conservation Ecology and Planning	03251028
Earth Science Practice and Management	02250072
Engineering and Environmental Geology	02250372
Entomology	03251031
Environment and Society	03251032
Environmental Ecology	03251033
Environmental Economy	03251034
Environmental Education	02250443
Exploration Geophysics	02250431
Food Science and Technology	03251110
Food Science	02250444
Genetics	03251051
Geography	02250411
Geo-Informatics	02250412
Geology	02250141
Integrated Pest and Disease Management	03251024
Mammology	03251027
Mathematical Statistics	02250191
Mathematics Education	02250183
Mathematics of Finance	02250182
Mathematics	02250181
Meteorology	02250070
Microbiology	03250911
Physics	02250231
Plant Pathology	03250881
Post Harvest Technology	03251102
Science Education	02250442
Soil Science	02250393
Systematics and Conservation Evaluation	03251026
Water Resource Management	03251035
Wildlife Management	03251001
Zoology	03251021

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 four-year BSc(Agric) 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, supplemented by ancillary module/s as may be required by the Dean, on the recommendation of the Head of Department. These ancillary module/s, if required, may be taken concurrent with the major subject. Students who hold the BSc(Agric)(Hons) degree, may be exempted from further ancillary modules.

(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 modules, 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 modules 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

Discipline	**Degree code**
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 AGRARIAE (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 module. Additional modules 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

Discipline	Degree code
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
Rural Development and Ecotourism 03252152	
Rural Development Planning	03252023
Rural 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) Programme options:
There are four disciplines with a further option to choose from, each with a minimum of 240 credits:

(i) **Dissertation option**

Interior Merchandise Management	02253004
Clothing Management	02253006
General	02253009
Food Management	02253008

(ii) **Coursework option with essay**

Interior Merchandise Management	02253003
Clothing Management	02253005
General	02253010
Food Management	02253007

(d) Curriculum (a minimum of 240 credits)

(i) **Dissertation option**
Research Methodology 814 (30 credits)

Theoretical Orientation (30 credits)*
Electives (a minimum of 60 credits)
HHK890 (Dissertation) (120 credits)

(ii) **Coursework option**
Research Methodology 814 (30 credits)
Theoretical Orientation (30 credits)*
Electives (a minimum of 60 credits)
HHK892 (Dissertation) (120 credits)

*To earn credits for the Theoretical Orientation, at least one of the following options must be taken:

HSK 810: Sociacultural studies (Cultural orientation) (15 credits)
HSK 812: Sociacultural studies (Consumer orientation) (15 credits)
HSK 813: Sociacultural studies (Sociacognitive orientation) (15 credits)
HSK 811: Social-cultural studies (Alternative orientation. Other applicable orientations offered in and outside the Department can be taken additionally) (15-30 credits).

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

- Clothing and Textiles
- Foods, Nutrition and Foodservice Management
- Interior Merchandising and Consumer Facilitation
- Resource Management, Development and Education

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, it may be required of the student to do additional modulework.
Work on the dissertation/essay consists of three parts, namely research proposal, project execution and an oral presentation of the research.

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

(e) Prerequisites for the dissertation/essay
The Department can be consulted for more information on the structuring of programmes, the content of the theoretical orientations, and electives including their prerequisites.

(f) Degrees

Discipline	**Degree code**
Interior Merchandise Management	02253004
Interior Merchandise Management (Taught)	02253003
Clothing Management	02253006
Clothing Management (Taught)	02253005
General	02253009
General (Taught)	02253010
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**

M Consumer Science or applicable Master's degree with a pass mark of at least 60%. To proceed with the thesis, a student should have fulfilled the requirements for the Master's 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 modulework.

(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 modules 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

Discipline	Degree code
Agrarian Extension	03262002
Agricultural Economics	03260042
Agronomy	03262164
Animal Production Management	02260545
Animal Science	03260141
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 and Mathematics Education	02260753
Soil Science	03262166
Sustainable Ecological Management	03262131
Sustainable Insect Management	03262132
Wildlife Management	03261001
Zoology	03261021

Sc.13 DOCTOR SCIENTIAE: DSc (Code 03260001)

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 IN THE FACULTY

Name	Donor	Award
Rüsch and Van Biljon-Price	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
A.M. Bosman Medal	Farmers' Weekly	To the most deserving postgraduate student in Animal Science
ABSA Consultants & Actuaries	ABSA	Best performance in AKM702
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
Capespan Prize	Capespan International	To the best student in Plant Pathology or Microbiology in the final year of the BSc(Agric) or BSc degree
Department of Chemistry Prize	Department of Chemistry, UP	3. Best achievement in Chemistry at 100 level. 2. Best achievement in Chemistry at 200 level.
Department of Physics Prize	Department of Physics, UP	4. Best achievement in Physics at first year level. 5. Best achievement in Physics at second year level. 6. Best achievement in Physics at third year level 4. Best achievement in Physics at BSc(Hons) level.
Dewald Hattingh Book Prize	Mrs ASJ Hattingh	For the best third-year student in Mathematics.
Dr and Mrs Geyer Floating Trophy	Dr and Mrs J W Geyer	Awarded to a student in the Faculty of Natural and Agricultural Sciences for academic excellence as well as other achievement
Financial Planning Institute	FPI	Best performance in IAS361 & IAS362
Financial Planning Institute (FPI)	FPI	Best performance in IAS261 & IAS262
Genetics Honours Achievement Award	Genetics Department	To the best Honours student in Genetics
GENSEC Prize	GENSEC	Most outstanding honours student in the Financial Mathematics study programme.
H.B. Davel Medal	Farmers' Weekly	To the student who completes the BSc(Agric) degree most successfully
Hannover Reinsurance	Hannover Reinsurance	Best performance in AKM704
Hollard Insurance	Hollard Insurance	Best performance in AKT780
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

Name	Donor	Award
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.
Johan and Sophie van Heerden Floating Trophy	Johan and Sophie van Heerden	A student that achieves the highest average mark for Meteorology modules at second and third-year level and who passes the third year level modules in a period of one year.
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 modules)
Junior Captain Scott Commemo-rative Medal	South African Biological Society	To the student who submits the best MSc dissertation in a biological field and on a subject to be dequarterined by the donor
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
Margaretha Mes Medal	Botany Department	For the best BSc(Hons) student who obtains the degree with a pass mark of at least 70% and whose essay is based on an aspect of Plant Physiology
Medal of the South African Society of Crop Production	South African Society of Crop Production	To the best BSc(Agric) student in Crop Production
Medal: Vice Chancellor and Principal	UP	Best achievement in all the undergraduate study years in any scientific field at the University of Pretoria
Meiring Naudé Medal	Dr S M Naude	For the best student who obtained at least 75% in all the theoretical and practical modules for the BSc(Hons) with specialization in Physics.
Merck Merit Award for Bio-chemistry (Hons)	Merck Chemicals (South Africa)	To the best student who obtains the Honours degree in Biochemistry with distinction
Merck Prize	Merck (Pty) Ltd	7. Best achievement in Chemistry at 300 level. 2. Best achievement in Analytical Chemistry at 300 level.
Munich Reinsurance	Munich Reinsurance	Best performance in IAS351 & IAS352
Novartis Prize	Novartis	To the best student in Plant Pathology in the final year of the BSc, BSc(Agric) or BInstAgrar degree module
Omnia Fertilizer Award	Omnia Fertilizer Incorporated	To the best final year student in Plant Production and Soil Science
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.
Rentmeester	Rentmeester	Best performance in IAS211 & IAS221
Richards Bay	Richards Bay Minerals	For best Honours student in Zoology

Name	Donor	Award
Minerals Junior Prestige Award		
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
Ryan Warren Award	Ryan Warren	Best performance in Financial Mathematics
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
SA Mathematical Society Bronze Medal	SA Mathematical Society	Best honours student in Mathematics or Applied Mathematics.
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
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
Sanlam Financial Advisory Service	Sanlam	Best performance on first-year level in all modules in the Insurance & Actuarial Sciences
SAPBA Prize	South African Plant Breeders Association	To the best final year student in Plant Breeding
SASAS Prize	South African Society of Animal Science	To the most outstanding undergraduate in Animal Science
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
SASAS Transvaal Branch Award	South African Society of Animal Science	To the most outstanding student in the third year of study in Animal Science
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
Sasol Prize	Sasol Ltd	1. Best achievement in Chemistry at 100 level, 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.

Name	Donor	Award
Schutte & Associates	Schutte & Associates	Best performance on second year level in compulsory modules in the Insurance & Actuarial Sciences
Schweickerdt Medal for Botany	The late Prof H G W J Schweickerdt	To the best BSc(Hons) student who obtained the degree with a pass mark of at least 70% and whose essay is based on an aspect of Botany other than Plant Physiology
The ISIS Software Engineering Prize	ISIS	For the best BSc(IT) group project in Software Engineering
The Microsoft Prize	Microsoft	For the best female student in Computer Science at 300 level
The Microsoft Prize	Microsoft	For the best student in the module Operating Systems at 200 level
The Microsoft Prize	Microsoft	For the best student in Computer Science at 100 level
The Roelf van den Heever/EPIUSE prize	EPI-USE	For the best student in Computer Science at honours level
Zoological Society of Southern Africa Prize	Zoological Society of Southern Africa	To the Honours student who obtains the BSc(Hons) degree with the highest average mark.
Zoological Society of Southern Africa Prize	Zoological Society of Southern Africa	To the best student in Zoology at 300 level
Department of Consumer Science		
Annique Theron Achievement Prize	Annique Theron	Top achiever in Home Economics General
Benjamin Woollens Achievement Prize	Benjamin Woollens	Top achiever in Clothing Construction 310 (theory and practice).
Bernina Achievement Prize	Bernina Saskor, JHB	Achievement in Garment Construction 310 (Theory and Practice).
Bernina Achievement Prize	Bernina Saskor, JHB	Best achievement in Clothing Construction 310 (design and creativity).
Bernina Achievement Prize	Bernina Saskor, JHB	Best achievement in Garment Construction 310 (practice).
Husqvarna Achievement Prize	Nordic Sewing Machines	Best achievement in VLG 310, 320 concurrently.
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 South African 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	Centre for Wildlife	To the best BSc(Hons) student with

Name	Donor	Award
Foundation Texas Merit Award	Research	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.