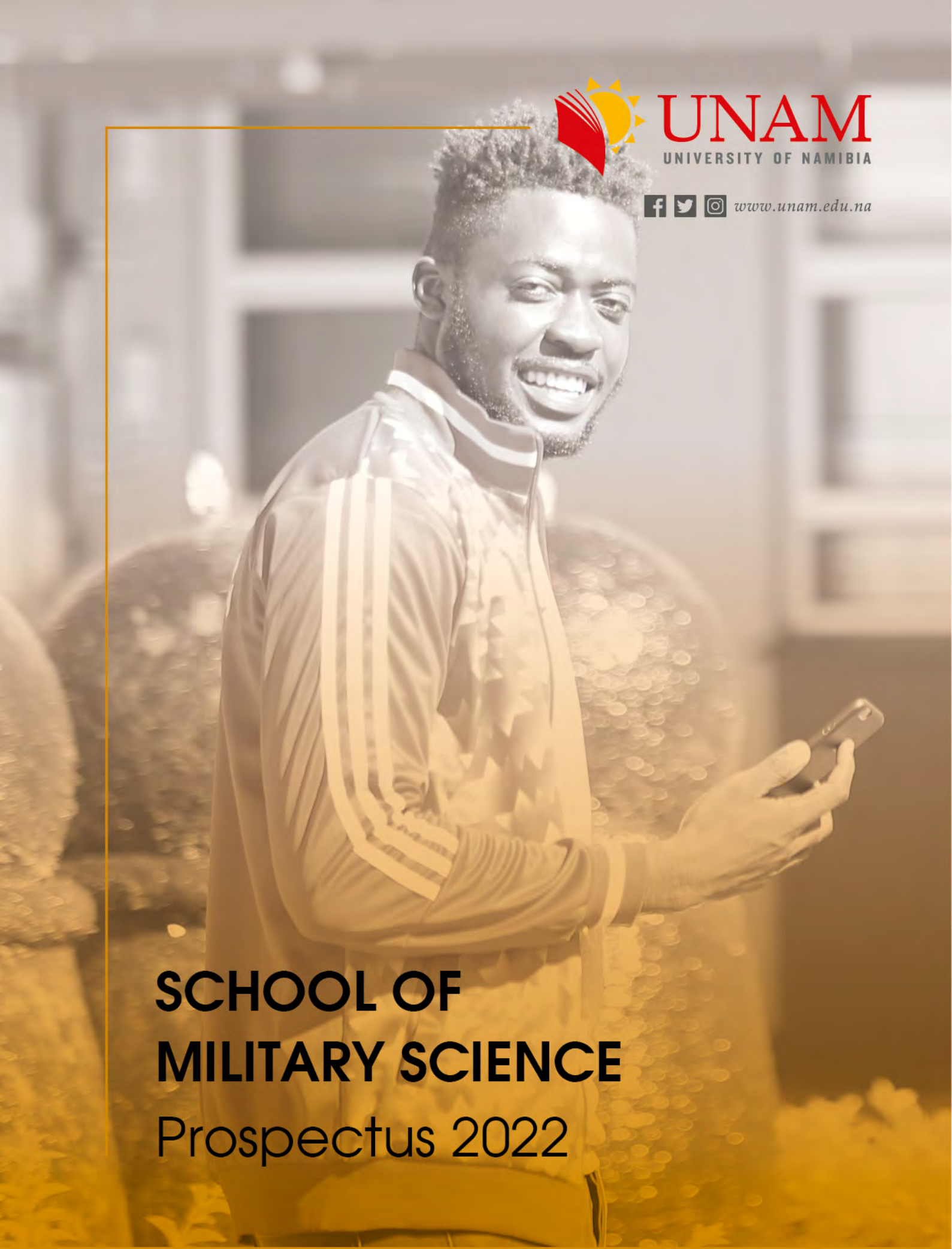

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UNIVERSITY OF NAMIBIA

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# SCHOOL OF MILITARY SCIENCE

Prospectus 2022

## FACULTY OF AGRICULTURE, ENGINEERING & NATURAL SCIENCES

## NOTE

Regulations and curricula for 2022 may be amended without prior notice. General regulations and information appear in the **General Information and Regulations and Fees Prospectus**.

Although the information contained in this School prospectus has been compiled as accurately as possible, Council and Senate accept no responsibility for any errors and omissions, which may occur. The University retains the right to amend any regulation or condition without prior notice.

The information is correct up to 30 October 2021.

The fact that particulars of a specific course or field of study have been included in this School Prospectus does not necessarily mean that such programme, subject, or course will be offered in 2022 or any consecutive year.

This School Prospectus must be read in conjunction with the **General Information and Regulations and Fees Prospectus**.

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## SCHOOL PREAMBLE

### Vision

The vision of the School of Military Science is to be a Centre of Excellence in developing knowledge and expertise in the fields of military history and military law, aeronautical science, nautical science and security and strategic studies in Namibia and the SADC Region.

### Mission

The School of Military Science is mandated to equip graduates with requisite skills and offer solid preparation for professional careers in military leadership as well as in public environment in the areas of commanding, analysis, research, consulting and analysis in the defence and national security.

The school fulfils the following functions in order to carry out its mandate:

- equip graduates with appropriate knowledge and skills and prepare them for a variety of careers according to national, regional and international needs
- carry out innovative research and disseminate knowledge that will benefit the national, regional and international contexts
- encourage growth in the adoption and use of contemporary military and civilian techniques and technologies for the benefit of the Namibian Defence Force
- provide variety of research and advisory services to the Ministry of Defence
- foster relationships with the stakeholders and industrial partners
- contribute to the social and economic development of Namibia

## ACADEMIC YEAR 2022

| | |
|---|---|
| **FIRST SEMESTER** | |
| 10 January | University Opens |
| 11 January | Start of Summer Term (Until 22 January) |
| 24 January | Academic staff resumes office duties |
| 14 February | Lectures commence for FIRST SEMESTER- Senior Students |
| 28 February | Lectures commence for FIRST SEMESTER- First Year Students |
| 11 April | First semester BREAK commences |
| 19 April | Lectures commence after first semester break |
| 20 May | Lectures end for FIRST SEMESTER- Senior Students |
| 31 May | Regular Examinations Commence - Senior Students |
| 07 June | Lectures end for FIRST SEMESTER- First Year Students |
| 13 June | Regular Examinations Commence - First Year Students |
| 21 June | Regular Examinations end - Senior Students |
| 24 June | Regular Examinations end - First Year Students |
| 30 June | End of FIRST SEMESTER |
| 04 July | Start of Winter Term (until 08 July) |
| 04 July – 08 July | Mid-year recess |
| 11 July – 15 July | Special/Supplementary/Winter Term Examinations commence(Until 15 July) |
| **SECOND SEMESTER** | |
| 25 July | Lectures commence for SECOND SEMESTER |
| 22 August | Second semester BREAK commences |
| 29 August | Lectures resume after second semester break |
| 21 October | Lectures end for SECOND SEMESTER |
| 27 October | Regular Examinations commence |
| 18 November | Regular Examinations end |
| 28 November | Special/Supplementary Examinations commence (Until 2 December) |
| 09 December | End of SECOND SEMESTER |
| 16 December | End of academic year |
| 09 January 2023 | Start of Summer School (until 21 January) |
| 12 January 2023 | University opens (2023 academic year) |
| 24 January 2023 | Academic staff resumes office duties |

## DUE DATES FOR THE 2022 ACADEMIC YEAR

| DATE | GENERAL DATES |
|---|---|
| 21 January | Last day for appeals (Semester 2 & Double modules – Regular and Supplementary/Special examinations of November 2021) |
| 14 January | Last day for application of retention of continuous assessment (CA) mark and<br>Last day for application for exemption(s) Senior Students) |
| 17 January | Last day for recommendation of retention of continuous assessment mark and Promotion Examinations by Faculties |
| 24 January | Last day for approval of retention of continuous assessment mark and Promotion Examination by Examinations Department |
| 07 February | Promotion Examination |
| 11 February | Last day for application for exemption(s) - Senior Students |
| 12 February | Last day for Late Registration for all Senior students (*Late fee payable*) |
| 12 February | Last day for approval of module(s) & qualification changes (Senior Students) |
| 4 March | Last day for application for exemption(s) (1st Year Students) |
| 11 March | Last day for approval of exemption(s) changes – all students |
| 29 April | Last day to submit Theses and Dissertations for examinations (for Spring Graduation 2022) |
| 02 August | Last day for Appeals (Semester 1 Modules - Regular and Supplementary/Special examinations of June 2022) |
| 31 August | Last day to submit outstanding documentation |
| 07 October | Last day to cancel enrolment |
| 28 October | Last day to submit Theses and Dissertations for examinations (For Autumn Graduation 2023) |
| **DATE** | **CANCELLATION DUE DATES** |
| 13 May | Last day to cancel Semester 1 modules |
| 07 October | Last day to cancel Semester 2 modules |
| 07 October | Last day to cancel Double modules (module that extends normally over one academic year |
| **DATE** | **FINANCE DUE DATES** |
| 18 March | Last day to cancel Semester 1 and Double modules with 100% credit |
| 30 Apri l | Last day to cancel Semester 1 modules with 50% credit |
| 24 June | Last day to cancel Double modules with 50% credit |
| 12 August | Last day to cancel Semester 2 modules with 100% credit |
| 31 August | Last day to cancel Semester 2 modules with 50% credit |

## A. STRUCTURE AND PERSONNEL OF THE FACULTY

### A.1. OFFICE OF THE ASSOCIATE DEAN

**ASSOCIATE DEAN**

**Brig Gen Mumba MT Mahela**

☎(+264 61) 206 4843 (+264 61) 206 4851 **mmahela@unam.na** ✉ Private Bag 13301, Windhoek, Namibia

**ACTING HEAD OF DEPARTMENT: MILITARY STUDIES**

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**HEAD OF DEPARTMENT: AERONAUTICS AND ASTRONAUTICS**

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**HEAD OF DEPARTMENT: NAUTICAL SCIENCE**

Mr D. Kimera; BSc. Eng (MAU); M.Sc. Eng (MAU)

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**SCHOOL COORDINATOR**

Col. F K Kavera;

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**Matters regarding specific subjects and departments should be addressed to the relevant Head of Department.**

**Faculty Officer**
Ms T Tjipura, B.Econ, M. Admin (UNAM)

**School Administrator**
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**School Secretary**
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General enquiries regarding the School of Military Science and the qualifications offered by the School should be directed to:

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**The Faculty Officer**
**School of Military Science**
**University of Namibia**
**Private Bag 13301**
**WINDHOEK**

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## A.2. ACADEMIC DEPARTMENTS

### DEPARTMENT OF MILITARY STUDIES

☏ (+264 61) 206 4938 (+264 61) 206 4851 **gnguluwe@unam.na** ✉ Private Bag 13301, Windhoek, Namibia

| | |
|---|---|
| Head of Department: | Ms G.L Nguluwe |
| Senior Lecturer | Dr R. O Iroanya: B. Sc, (Nnamdi Azikiwe University, Awka, Nigeria); BA. (Hons)(University of Pretoria, MSocSci, EHESS, Paris); &(MASci, Linköping University, Sweden); (MSS), (University of Pretoria, PhD (University of Pretoria, South Africa) |
| Lecturer: | Ms. M. M. Mpuka: MSc (University of Leicester UK), MPhil ( University of Pretoria, SA) |
| Lecturer: | Ms. C. B. Simataa: Bsc (Hons) (UNAM), MSc. (JSS University, India) |
| Staff Development Fellow: | Mr. B. T. Tshelakgosi, Bsc. (Hons) (UNAM) |
| Staff Development Fellow: | Mr. A. Justinu. BSc (Army)(Hons) (UNAM) |
| Lecturer: | Ms G.L Nguluwe: DLGS (UNAM), BPMM (Hons.) (UNAM), MPA (UNAM) |
| Lecturer: | Dr. L. V. Shaamhula: Bsc Population Studies and Geography (UNAM), MA (Northwest University), PhD (Stellenbosh University) |
| Lecturer: | Mr S Ndapulamo: DLGS (UNAM), BPMM (Hons.) (UNAM), MPA (UNAM) |
| Staff Development Fellow: | Vacant |

### DEPARTMENT OF AERONAUTICS AND ASTRONAUTICS

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| | |
|---|---|
| Head of Department: | Mr. J.S. Anghuwo; BSc Air Force Science (Greece); MEng Space Technology Applications (Beijing,China) |
| Lecturer: | Mr. P. Imanuel; BSc (University Saad Dahlab of Blida (Algeria); MSc (University Saad Dahlab of Blida(Algeria) |
| Lecturer: | Dr W.P.Kiburu; BSc Physics (Hons) (JKUAT, Kenya); MAS (ERAU, USA); PhD (Azteca University,Mexico), DBA(UCN, Nicaragua) |
| Staff Development Felllow: | Vacant |

### DEPARTMENT OF NAUTICAL SCIENCE

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| | |
|---|---|
| Head of Department: | Dr. D. Kimera; BSc. Eng (MAU); M.Sc. Eng (MAU); PhD (UNAM) |
| Lecturer: | Maj. T. Kathindi BSc (Mi), MSc (National university of science and Technology (Misis) |
| Staff Development Fellow: | Capt. J.J Claassen; B. Naval Science (NAB) |
| Staff Development Fellow: | Mr. J. Kapiti; BSc. Nautical Science (UNAM) |
| Associate Professor: | Vacant |
| Staff Development Fellow: | Vacant |

B. QUALIFICATIONS OFFERED BY THE SCHOOL

The School may award the following Undergraduate and Postgraduate degrees:

## B.1. UNDERGRADUATE PROGRAMMES AND POSTGRADUATE PROGRAMMES

### B.1.8. SCHOOL OF MILITARY SCIENCE

| CODE | DEGREE | MINIMUM DURATION |
|---|---|---|
| **21BMSA** | Bachelor of Military Science Army Honours | 4 years full-time |
| **21BMSR** | Bachelor of Military Science Aeronautical Honours | 4 years full-time |
| **21BMSM** | Bachelor of Military Science Nautical-Mechanical Honours | 4 years full-time |
| **21BMSE** | Bachelor of Military Science Nautical-Electronics Honours | 4 years full-time |
| **21BMSW** | Bachelor of Military Science Nautical-Weapon Systems Honours | 4 years full-time |
| | | |
| **POSTGRADUATE PROGRAMME** | | |
| **21 PDSS** | Postgraduate Diploma in Security and Strategic Studies | 1 year full-time |
| **21 MASS** | Master of Arts in Security and Strategic Studies | 2 years full-time |

## C. GENERAL REGULATION PERTAINING TO UNDERGRADUATE STUDIES

### C.1. DURATION OF STUDY

All Bachelor of Science Honours degree programmes cannot be completed in less than four (4) years. All Bachelor of Science Honours degrees must be completed within six (6) years of full-time study, unless special permission is granted for this period to be exceeded.

### C.2. TWO MODES OF STUDY FOR FIRST YEAR MATHEMATICS NO LONGER ON OFFER IN 2022

All students will not be able to register for the Slow Mode Mathematics modules in 2022 as this has now been discontinued.

### C.3. EXEMPTIONS

UNAM will give exemptions for equivalent courses taken at other tertiary institutions but the exemptions shall not exceed 50% of the programme of the Bachelor of Science degree. See the General Information & Regulations Prospectus and Fees Prospectus.

### C.4. CLASS ATTENDANCE

In order to be admitted to examinations, students are required to attend at least **80%** of the lectures and to complete the required elements that make up the continuous assessment mark. Refer to the **General Information and Regulations Prospectus**.

### C.5. PRACTICALS

Attendance of practical sessions is compulsory.

### C.6. CURRICULUM

#### *C.6.1. COURSES, CREDITS AND CONTACT HOURS*

One contact hour is equivalent to one **(1)** lecture period on the timetable of the Faculty of Science.
A **full semester course** carries **16** credits and is taught at four **(4)** contact hours per week over one semester, i.e. **56** contact hours per semester.
A **half –course** carries **8** credits and is taught at two **(2)** contact hours per week over one semester, i.e. 28 contact hours per semester.
A **double-course** carries **32** credits and extends over one academic year at four **(4**) periods per week and terminates in an examination at the end of the year. (For the composition of a curriculum a double module is regarded as equal to two courses)
Refer to the relevant programmes (to determine the credits and contact hours of any particular course).

#### *C.6.2. CURRICULUM COMPILATION*

To be awarded a Bachelor's degree by the School, a student must pass all the courses prescribed for each curriculum combination. In the BSc Honours degree programme a student maybe required to select the courses offered by a specific department, in accordance with Faculty of Agriculture, Engineering and Natural Sciences and School regulations.

#### *C.6.3. STUDENT REGISTRATION*

##### *C.6.3.1. UNIVERSITY CORE CURRICULUM*

All students will take the equivalent of four (4) courses (48 credits) in the **University Core Curriculum** in the first year of study as part of their curriculum.

All students register for the following two (2) half-courses:

| SEMESTER | CODE | COURSE NAME |
|---|---|---|
| 1&2 | CSI3580 | Contemporary Social Issues (half-course) |
| 1 | CLC3509 | Computer Literacy (half-course) |

Students furthermore add the equivalent of **two (2)** full English courses from the **University Core Curriculum** to their curriculum according to the following rules:

Students with any one of the following qualifications in English will apply to be **credited/exempted** for **LCE3419 English Communication and Study Skills** and will register for the course below: (a) a pass (minimum grade 4) in English First Language at NSSC Higher Level or the equivalent; (b) grade 1, 2 or 3 in English Second Language at NSSC Higher Level or the equivalent.

| SEMESTER | CODE | COURSE NAME |
|---|---|---|
| 1 | LCE3419 | English Communication and Study Skills |
| 2 | LEA3519 | English for Academic Purposes |

Students with a D symbol in English Second Language at NSSC Ordinary Level, or the equivalent, register for only the double-coursebelow:

| SEMESTER | CODE | COURSE NAME |
|---|---|---|
| 1 & 2 | LEG 2410 | English for General Communication (double-course) |

**LEG2410 ENGLISH FOR GENERAL COMMUNICATION**

| | |
|---|---|
| **Course title:** | **English for General Communication** |
| **Code:** | **LEG2410** |
| **NQF Level:** | 4 |
| **Contact hours:** | 4 hours per week for two semesters |
| **Credits:** | 32 |
| **Course Assessment:** | Continuous assessment (**60%**):4 reading tests, 4 writing tests, 2 oral presentations and 1 literature worksheet. 1x3 hour examination paper (**40%**): |
| **Pre-requisites:** | None |

**Course description:** This course attempts to assist students to improve their general English proficiency. The main goal of this course is to develop the reading, writing, listening, speaking and study skills of students in order for them to perform tasks in an academic environment and beyond.

### *C.6.3.2. UNIVERSITY CORE CURRICULUM COURSE DESCRIPTIONS*

**LCE3419 ENGLISH COMMUNICATION & STUDY SKILLS**

| | |
|---|---|
| **Course title:** | **ENGLISH COMMUNICATION AND STUDY SKILLS** |
| **Code:** | **LCE3419** |
| **NQF Level:** | 4 |
| **Contact hours:** | 4 hours per week for one semester |
| **Credits:** | 16 |
| **Course Assessment:** | Continuous assessment (60%): two tests (reading and writing), two reading assignments, one oral presentation Examination (40%): one 3-hour examination paper |
| **Pre-requisites:** | None |

**Course description:** This course is aimed at assisting students in the development of their reading, writing and speaking and listening skills, in order to cope with studying in a new academic environment and in a language which may not be their first language. The course also focuses on study skills that students need throughout their academic careers and beyond. The course serves as an introduction to university level academics, where styles of teaching and learning differ from those at secondary schools in that more responsibility is placed on the student. The course therefore, focuses on the skills that students need throughout their academic careers and beyond.

**LEA3519 ENGLISH FOR ACADEMIC PURPOSES**

| | |
|---|---|
| **Course title:** | **ENGLISH FOR ACADEMIC PURPOSES** |
| **Code:** | **LEA3519** |
| **NQF level:** | 5 |
| **Contact hours:** | 4 periods per week for one semester |
| **Credits:** | 16 |
| **Course assessment:** | Continuous assessment (**60%**): 2 tests (reading and writing), 1 academic written essay, 1 oral presentation Examination **(40%)**: One three-hour examination paper |
| **Prerequisites:** | None |

**Course description:** This course develops a student's understanding, and competencies regarding academic conventions such as academic reading, writing, listening and oral presentation skills for academic purposes. Students are required to produce a referenced and researched essay written in formal academic style within the context of their university studies. Students are also required to do oral presentations based on their essays. The reading component of the course deals with academic level texts. This involves students in a detailed critical analysis of such texts. The main aim is therefore, to develop academic literacy in English.

**CLC3509 COMPUTER LITERACY**

| | |
|---|---|
| **Course title:** | **COMPUTER LITERACY** |
| **Code:** | **CLC3509** |
| **NQF level:** | 4 |
| **Contact hours:** | 1 lecture theory and 1 lecture practical per week for one semester |
| **Credits:** | 8 |
| **Course assessment:** | Continuous Assessment **100%**: 2 Practical Tests **50%**, 2 Theory Tests **50%** |
| **Prerequisites:** | None |

**Course description:** The aim of this course is to equip the students through hands-on experience with the necessary skills to use application software: word processing, spreadsheets, databases, presentations and communications. The objective is to increase student's productivity in both the education and later, the work environment.

**Content:** The course covers the following topics. Introduction to Computers: hardware and software, types and categories of computers, usage of Computer devices and peripherals. Working with the windows operating system: File Management, working with multiple programs, using the recycle bin. Using a word processor: formatting a text and documents, spelling check, grammar and thesaurus tools, inserting tables, auto-shapes, clip arts, charts, and mail merge. Spreadsheet: worksheets and workbooks, ranges, formulas and functions, creating graphs, charts, and printing the workbook. Databases: creating tables, relationships, queries, forms and reports. Presentation software: slide layout and master, animations, auto-content wizard and templates. Communication tools: introduction to the Internet, web browsers, search engines, downloading and uploading files, creating and sending messages, email etiquette, internet security, and digital signatures.

**FIRST AND SECOND SEMESTER COURSE**

**CONTEMPORARY SOCIAL ISSUES CSI3580**

| | |
|---|---|
| **Course title:** | **CONTEMPORARY SOCIAL ISSUES CSI3580** |
| **NQF:** | 5 |
| **Credits:** | 8 |
| **Continuous assessment:** | Continuous Assessment **100%**: Quizzes, Tests, Moodle Assignments, Journal Entries, Reflections, Service and Experiential Learning Projects |
| **Prerequisite:** | None |

**Course Content:** The module is designed to encourage behavioural change among UNAM students and inculcate the primacy of moral reasoning in their social relations and their academic lives. In providing students with critical and analytical thinking the module enables students to grow and develop into well rounded citizens, capable of solving contemporary social challenges experienced in their communities and societies. The teaching of the module takes three dimensions: the intellectual, the professional and the personal dimensions. The intellectual dimension is fostered through engaging students with subject knowledge, independent learning and module assessment. The professional dimension, on the other hand, is fostered through exposing students to real life situations of case studies and practical exercises that draws attention to social issues that attract on-going political, public and media attention and/or debate.

### *C.6.3.3. FACULTY OF AGRICULURE, ENGINEERING AND NATURAL SCIENCES CORE CURRICULUM*

All students must register for the following **two (2)** full courses **(32 credits)**:

MAT3511 Basic Mathematics
MAT3512 Precalculus

### *C.6.3.4. FACULTY OF AGRICULTURE, ENGINEERING AND NATURAL SCIENCES CORE CURRICULUM COURSE DESCRIPTIONS*

**MAT3511 BASIC MATHEMATICS**

| | |
|---|---|
| **Course Code** | MAT3511 |
| **NQF Level** | 5 |
| **Notional Hours** | 160 |
| **NQF Credits** | 16 |
| **Prerequisite** | None |
| **Contact Hours** | 4 lectures plus **2** tutorials per week for one semester |

**Course Assessment:** Continuous Assessment: **50%** (minimum of 3 class tests). Examination: **50%** (1 x 3-hour paper).

**Course description: Algebraic expressions:** Simplification, expansion, factorization, polynomials, remainder and factor theorem, quadratic polynomial. Binomial expansions, Pascal's triangle and the Binomial Theorem.Rational expressions, partial fractions. **Equations and inequalities:** Linear equations in one-variable, simultaneous linear equations, quadratic equations, simultaneous non-linear equations. Linear inequalities, non-linear inequalities. **Sets:** What is a set? Set notation, equality of sets, subsets, characterization of equality via the subset relation, empty set, power sets, Venn diagrams, intersection, union, complement, de Morgan's laws, set difference, symmetric difference, proofs of *simple results* on set equality. Standard examples of sets: natural numbers, integers, rationals, real numbers. Absolute value, intervals in R. A bit about cardinality of sets (examples of finite, *infinite, countable, uncountable sets)*. **Trigonometry:** Trigonometric ratios, angle orientation in the *xy*-plane, graphs of trigonometric functions, trigonometric identities, justifying (proving) equality of relatively simple trigonometric expressions. Sum/difference, double angle, half angle and sum to product formulas. **Sequences:** Definition, notation, obtaining the general term in sequences, arithmetic sequences, geometric sequences, recursively defined sequences.

**MAT3512 PRECALCULUS**

| | |
|---|---|
| **Course Code** | **MAT3512** |
| **NQF Level** | **5** |
| **Notional Hours** | **160** |
| **NQF Credits** | **16** |
| **Prerequisite** | **None** |
| **Contact Hours** | **4** lectures plus **1 x 2 hour** tutorial per week for one semester |

**Course description: Functions:** one-to-one, onto and bijective functions, horizontal line test, inverse of a function. **Combinations of functions:** composition of functions, sum, difference, quotient of functions and their domains. Polynomial functions, rational functions and their graphs. Introduction of exponential and logarithmic functions. Trigonometric functions and their graphs, inverse trigonometric functions, trigonometric equations. **Limit of a function:** definition, left and right limits, improper limits, continuity in terms of limits. **Differentiation:** rate of change, derivative of a function, rules of differentiation, derivatives of polynomial and rational functions, increasing and decreasing functions and graph sketching. **Integration:** Antiderivatives (polynomial functions and rational exponents), the definite integral, area under a graph.

### C.7. EXAMINATION REGULATIONS

For detailed examination and promotion rules see the General Information & Regulations Prospectus. A candidate will be eligible to write the examination if he/she has obtained the required continuous assessment mark of 40%. Examination will be administered at the end of each semester.

### C.8. RE-ADMISSION INTO THE SCHOOL OF MILITARY SCIENCE

**A student will not be re-admitted into the School if he/she has not passed the required courses to be re-admitted**

### C.9. PASS REQUIREMENTS

In all cases, prerequisites for courses have to be passed before a student can proceed to register for courses that require prerequisites.

- All **first year** courses must be passed before one can register for **third year** courses.
- All **second year** courses must be passed before one can register for **fourth year** courses

### C.10. MAXIMUM NUMBER OF COURSES PER YEAR

No student will be allowed to register for more than **12** courses per year

### C.11. COURSE RESTRICTIONS

A student will be admitted to a specific course only if he/she meets the requirements for the particular course. The **UNAM CORE**, as well as **MAT3511 Basic Mathematics** and **MAT3512 Precalculus** are compulsory for all **first year** B.Sc. Honours degree students, including all students from other Faculties/Schools who wish to major in a subject offered by the Faculty of Agriculture, Engineering and Natural Sciences.

# D. SCHOOL OF MILITARY SCIENCE

## D.1. REGULATIONS PERTAINING TO UNDERGRADUATE QUALIFICATIONS

### *D.1.1. COMPULSORY REQUIREMENTS*

The minimum entry requirements for admission into first year Military Science are as follows:

Candidates must be NDF officers at the rank of 2nd Lt. – Capt./equivalent and approved by the Ministry of Defence.

The normal basic requirement for entrance to undergraduate degree programs shall be a Namibia Senior Secondary Certificate (NSSC), provided that the candidate should obtain a minimum of 25 points on the University of Namibia's Evaluation Point Scale in his/her five (5) best subjects (of which Mathematics, Physical Science and English must be included) to be admitted to undergraduate studies.

Students require at least a symbol C on NSSC level or equivalent qualification in Mathematics, at least a C symbol on NSSC or equivalent qualification in Physical Science

English is a compulsory subject and should normally have been obtained as a Second Language at NSSC (O-level) with a C-symbol as minimum requirement, or English as a First Language at NSSC (O-level) with a D-symbol as a minimum.

Successful completion of the science foundation program with a minimum of 60% average (in addition to the 60% average, the student need to pass all five subjects with a minimum of 50%).

Obtaining the minimum number of points however, does not necessarily ensure admission. Admission is based on places available in the program and is awarded on the basis of merit. Refer to the General Admission Criteria for Undergraduate Programs in the General Information and Regulations Yearbook.

### *D.1.2. COMPILATION OF THE CA MARK*

- Details on how the CA for each course is compiled are given under the respective courses.

### *D.1.3. WEIGHTING OF CA AND EXAM MARKS*

- Unless otherwise indicated, the relationship between the CA mark and the Examination mark is **50:50.**
-

### *D.1.4. MINIMUM REQUIREMENTS FOR RE-ADMISSION*

To be re-admitted into the School of Military Science for a particular year of registration, a student must have passed the minimum number of modules as indicated below:

- At least **64** credits by the end of the first year (at least **40%** of total credits in Year 1)
- At least **80%** of Year 1 credits plus **40%** of Year 2 credits by the end of the second year.
- All (**100%**) Year 1 credits plus at least **80%** of Year 2 credits plus at least **40%** of Year 3 credits by the end of the third year.
- All (**100%**) of Year 1 and Year 2 credits plus **80%** of Year 3 credits plus **20%** of Year 4 credits by the end of the fourth year.

### *D.1.5. ADVANCEMENT AND PROGRESSION RULES*

A student advances to the following academic level of study when at least two thirds of the modules of the curriculum for a specific year have been passed. If a student passed only one third of the full curriculum of a specific year, he/she may not register for any modules of the following year. In all cases prerequisites for modules have to be passed before a student can proceed to register for modules that require prerequisites.

**From Year 1 to Year 2**
At least 7and (1/2) courses (equivalent to **112** credits) prescribed for Year 1

**From Year 2 to Year 3**
All the **first year courses** plus At least 6 courses (equivalent to **96** credits) prescribed for Year 2

**From Year 3 to Year 4**
All **second year** modules plus at least 5 courses (equivalent to **80** credits) prescribed for Year 3

## D.2. REGULATION PERTAINING TO POSTGRADUATE DIPLOMA STUDIES

### D.2.1. ADMISSION REQUIREMENTS

- Prospective students must be in possession of a Bachelor's degree or an equivalent degree from the University of Namibia or any other recognized institution of higher learning.
- Students who do not comply with (1) above, but possess senior military qualifications such as Senior Staff and Command Courses and Ten (10) years of experience, in a senior management/command position may also be considered for admission.
- Prospective students will be required to write a one-page submission to articulate the goals of their undertaking the Postgraduate studies, and the Faculty reserves the right to interview applicants.
- Submission of an application for admission to the Postgraduate Diploma in Security and Strategic Studies programme does guarantee admission to the programme.

### *D.2.2. MODE OF DELIVERY*

This programme will be offered on a block release basis. The mode of teaching will include lectures, assignments (individual/group), seminars etc.

### D.2.3. DURATION OF STUDY

The duration of the programme is one year. The maximum duration for this programme is two years.

### *D.2.4. ASSESSMENT CRITERIA*

The studies, examination procedures, and admission to examinations for the Postgraduate Diploma in Security and Strategic Studies (PDSSS) will be governed by the University of Namibia examination regulations.
a) Continuous assessment: 50% b) Final Examination (paper 1x3 hours): 50%
Pass requirements - A student must obtain a minimum of 40% in continuous assessment to qualify for admission to examinations and a minimum of 50% to pass a particular course. Where summative assessment in the form of examination is not applicable, a student must obtain a minimum of 50% from continuous assessment, comprising of not less than two assessable tasks to pass the course.

### D.2.5. REQUIREMENTS FOR QUALIFICATION AWARD

The Postgraduate Diploma in Security and Strategic Studies (PDSSS) will be awarded to students credited with a minimum number of 152 credits, and who have met the requirements of 136 credits from compulsory and 16 credits from elective courses.

## D.3. BACHELOR OF SCIENCE IN MILITARY SCIENCE (ARMY) HONOURS

**Qualification: BSc. Honours Military Science Army 21BMSA**

Students opting for a Military Science (Army) must take all of the following courses:

**YEAR 1**

| SEMESTER | MODULE NAME | COURSE CODE | CREDITS | PRE-REQUISITES | CO-REQUISITES |
|---|---|---|---|---|---|
| 1 | English Communication & Study Skills | LCE 3419 | 16 | None | None |
| 1 | Basic Mathematics | MAT3511 | 16 | None | None |
| 1 | Computer Literacy | CLC3509 | 8 | None | None |
| 1 | Analytic Geometry | MAT3501 | 8 | None | None |
| 1 | Matrices and Complex Numbers | MAT3521 | 8 | None | None |
| 1 | Physics for Physical Sciences I | PHY3511 | 16 | None | None |
| 1 | Fundamentals of Information Technology I | CIT3521 | 8 | None | None |
| 2 | English for Academic Purposes | LEA3519 | 16 | None | LCE3419 |
| 1&2 | Contemporary Social Issues | CSI3580 | 8 | None | None |
| 2 | Fundamentals of Information Technology II | CIT3512 | 16 | None | CIT3521 |
| 2 | Precalculus | MAT3512 | 16 | None | None |
| 2 | Introduction to Statistics | STS3522 | 8 | None | None |
| 2 | Physics for Physical Sciences II | PHY3512 | 16 | None | None |
| **Total Credits** | | | **160** | | |

**YEAR 2**

| SEMESTER | MODULE NAME | COURSE CODE | CREDITS | PRE-REQUISITES | CO-REQUISITES |
|---|---|---|---|---|---|
| 1 | Calculus I | MAT3611 | 16 | MAT3512 | None |
| 1 | Numerical Methods with MATLAB | MAT3641 | 8 | MAT3521 | None |
| 1 | Mechanics and Waves | PHY3651 | 16 | MAT3512 &PHY3511 | None |
| 1 | Human Resource Management I | ARM3641 | 8 | None | None |
| 1 | Concepts and Techniques in Military Geography | ARM3611 | 16 | None | None |
| 1 | Physical Environment I | ARM3601 | 8 | None | None |
| 2 | Calculus II | MAT3612 | 16 | MAT3512 | None |
| 2 | Ordinary Differential Equations | MAT3642 | 8 | MAT3521 and MAT3512 | None |
| 2 | Electromagnetism | PHY3612 | 16 | PHY3512 and MAT3512 | None |
| 2 | Human Resource Management II | ARM3642 | 8 | ARM3641 | None |
| 2 | Physical Environment II | ARM3612 | 16 | ARM3601 | None |
| **Total Credits** | | | **136** | | |

**YEAR 3**

| SEMESTER | MODULE NAME | MODULE CODE | CREDITS | PRE-REQUISITES | CO-REQUISITES |
|---|---|---|---|---|---|
| 1 | Electrodynamics | PHY3711 | 16 | PHY3612 & MAT3612 | None |
| 1 | Military Psychology | ARM3721 | 8 | None | None |
| 1 | Military Management | ARM3741 | 8 | None | None |
| 1 | Military History | ARM3761 | 8 | None | None |
| 1 | Military Conduct and Environment | ARM3711 | 16 | ARM3611 | None |
| 2 | Research Methodology | AER3732 | 8 | STS3522 | None |
| 2 | Modern Physics | PHY3752 | 16 | MAT3512 and either PHY3651 or PHY3612 | None |
| 2 | Africa and International Political Economy | ARM3732 | 16 | None | None |
| 2 | Geography of Sub-Saharan Africa | ARM3712 | 16 | ARM3611 | None |
| 2 | Contemporary Political Relations | ARM3772 | 16 | None | None |
| **Total Credits** | | | **128** | | |

**YEAR 4**

| SEMESTER | MODULE NAME | MODULE CODE | CREDITS | PRE-REQUISITES | CO-REQUISITES |
|---|---|---|---|---|---|
| 1&2 | Research Project | ARM3810 | 32 | AER3732 | None |
| 1 | Advanced Electrodynamics | PHY3809 | 8 | PHY3711 | None |
| 1 | Military Leadership | ARM3831 | 16 | ARM3741 | None |
| 1 | Economics I | ARM3851 | 16 | None | None |
| 1 | Geographical Information Systems | ARM3811 | 16 | ARM3712 | ARM3852 |
| 2 | Nuclear Physics | PHY3802 | 8 | PHY3752 | None |
| 2 | Economics II | ARM3872 | 16 | ARM3851 | None |
| 2 | Remote Sensing | ARM3852 | 16 | ARM3712 & ARM3811 | None |
| **Total Credits** | | | **128** | | |

**FIRST YEAR COURSES**

**LCE3419 ENGLISH COMMUNICATION & STUDY SKILLS**

| | |
|---|---|
| **Course title:** | **ENGLISH COMMUNICATION AND STUDY SKILLS** |
| **Code:** | **LCE3419** |
| **NQF Level:** | 4 |
| **Contact hours:** | 4 hours per week for one semester |
| **Credits:** | 16 |
| **Course Assessment:** | Continuous assessment (60%): two tests (reading and writing), two reading assignments, one oral presentation Examination (40%): one 3-hour examination paper |
| **Pre-requisites:** | None |

**Course description:** This course is aimed at assisting students in the development of their reading, writing and speaking and listening skills, in order to cope with studying in a new academic environment and in a language which may not be their first language. The course also focuses on study skills that students need throughout their academic careers and beyond. The course serves as an introduction to university level academics, where styles of teaching and learning differ from those at secondary schools in that more responsibility is placed on the student. The course therefore, focuses on the skills that students need throughout their academic careers and beyond.

**MAT3511 BASIC MATHEMATICS**

| | |
|---|---|
| **Course Code** | MAT3511 |
| **NQF Level** | 5 |
| **Notional Hours** | 160 |
| **NQF Credits** | 16 |
| **Prerequisite** | None |
| **Contact Hours** | 4 lectures plus **2** tutorials per week for one semester |

**Course Assessment:** Continuous Assessment: **50%** (minimum of 3 class tests). Examination: **50%** (1 x 3-hour paper).

**Course description: Algebraic expressions:** Simplification, expansion, factorization, polynomials, remainder and factor theorem, quadratic polynomial. Binomial expansions, Pascal's triangle and the Binomial Theorem.Rational expressions, partial fractions. **Equations and inequalities:** Linear equations in one-variable, simultaneous linear equations, quadratic equations, simultaneous non-linear equations. Linear inequalities, non-linear inequalities. **Sets:** What is a set? Set notation, equality of sets, subsets, characterization of equality via the subset relation, empty set, power sets, Venn diagrams, intersection, union, complement, de Morgan's laws, set difference, symmetric difference, proofs of *simple results* on set equality. Standard examples of sets: natural numbers, integers, rationals, real numbers. Absolute value, intervals in R. A bit about cardinality of sets (examples of finite, *infinite, countable, uncountable sets)*. **Trigonometry:** Trigonometric ratios, angle orientation in the *xy*-plane, graphs of trigonometric functions, trigonometric identities, justifying (proving) equality of relatively simple trigonometric expressions. Sum/difference, double angle, half angle and sum to product formulas. **Sequences:** Definition, notation, obtaining the general term in sequences, arithmetic sequences, geometric sequences, recursively defined sequences.

**CLC3509 COMPUTER LITERACY**

| | |
|---|---|
| **Course title:** | **COMPUTER LITERACY** |
| **Code:** | **CLC3509** |
| **NQF level:** | 4 |
| **Contact hours:** | 1 lecture theory and 1 lecture practical per week for one semester |
| **Credits:** | 8 |
| **Course assessment:** | Continuous Assessment **100%**: 2 Practical Tests **50%**, 2 Theory Tests **50%** |
| **Prerequisites:** | None |

**Course description:** The aim of this course is to equip the students through hands-on experience with the necessary skills to use application software: word processing, spreadsheets, databases, presentations and communications. The objective is to increase student's productivity in both the education and later, the work environment.

**Content:** The course covers the following topics. Introduction to Computers: hardware and software, types and categories of computers, usage of Computer devices and peripherals. Working with the windows operating system: File Management, working with multiple programs, using the recycle bin. Using a word processor: formatting a text and documents, spelling check, grammar and thesaurus tools, inserting tables, auto-shapes, clip arts, charts, and mail merge. Spreadsheet: worksheets and workbooks, ranges, formulas and functions, creating graphs, charts, and printing the workbook. Databases: creating tables, relationships, queries, forms and reports. Presentation software: slide layout and master, animations, auto-content wizard and templates. Communication tools: introduction to the Internet, web browsers, search engines, downloading and uploading files, creating and sending messages, email etiquette, internet security, and digital signatures.

**MAT3501 ANALYTIC GEOMETRY**

**Course Code:** **MAT3501**
**NQF Level:** 5
**Notional Hours:** 80
**NQF Credits:** 8
**Prerequisite:** None
**Contact Hours:** 2 lectures plus 1 tutorial per week for one semester
**Course Assessment:** Continuous Assessment: 50% (minimum of 2 class tests). Examination: 50% (1 x 2-hour paper).
**Course description: Introduction:** Lines, circles and tangent lines. **Conic sections:** ellipse, parabola, hyperbola. Translation and rotation of the axes. **Parametric equations:** circle, ellipse, Parabola, Hyperbola, cycloids. **Polar coordinates:** definition, relating polar and Cartesian coordinates, Conic sections in polar coordinates. **Surfaces and quadrics:** Spheres, cylinders, ellipsoids, paraboloids, hyperboloids, cones. Spherical and cylindrical coordinates.

**MAT3521 MATRICES AND COMPLEX NUMBERS**

**Course Code:** MAT3521
**NQF Level:** 5
**Notional Hours:** 80
**NQF Credits:** 8
**Prerequisite:** None
**Contact Hours:** 2 lectures plus 1 tutorial per week for one semester
**Course Assessment:** Continuous Assessment: 50% (minimum of 2 class tests). Examination: 50% (1 x 2-hour paper).
**Course description: Vectors in 2-and 3-dimensions:** addition of vectors, multiplication by a scalar, norm of a vector, dot product, cross product. Lines and planes in 3D-space. **Systems of linear equations:** introduction to linear systems, solution by Gaussian elimination and Gauss–Jordan elimination (for up to 3 x 3). **Matrices:** addition, multiplication, scalar multiplication, transpose (for up to 3 x 3), elementary matrices, diagonal, triangular and symmetric matrices, determinant and inverse (for up to 3 x 3), solutions of systems of linear equations by Cramer's rule (for up to 3 x 3). **Complex Numbers:** complex planes, operations on complex numbers, modulus, complex conjugate, division, modulus-argument form, de Moivre's formula, Euler's formula, Fundamental Theorem of Algebra.

**PHY3511: PHYSICS FOR PHYSICAL SCIENCES I**

**Course title:** **PHYSICS FOR PHYSICAL SCIENCES I**
**Code:** **PHY3511**
**NQF level:** 5
**Contact hours:** 56 Lectures and 14 Practical Sessions/Tutorials
**Credits:** 16
**Course assessment:** Continuous Assessment (**50%**) and 1 x 3-hour Exam Paper (**50%**)
Continuous Assessment will consist of three (3) class tests, at least two (2) tutorial tests/assignments and practical report(s) consolidated to one (1) practical mark.
**Pre-requisites:** NSSC Physical Science and Mathematics (C-symbols)
**Co-requisites:** None
**Course description:** Units, significant figures & scientific notation; vectors: properties, components, unit vectors, products; average & instantaneous speed, velocity and acceleration; one dimensional motion with constant acceleration; falling bodies; two dimensional motion with constant acceleration; projectile motion; uniform circular motion; circular motion; relative velocity and acceleration; Newton's laws; inertial frames; weight; friction; applications; work and kinetic energy; power; conservative and non-conservative forces; gravitational potential energy; conservation theorem; work-energy theorem; linear momentum & impulse; conservation of linear momentum - 2 particle system; collisions; equilibrium; centre of gravity; applications; Newtonian gravitation; gravitational constant; weight & gravitational force; Kepler's laws; pressure; Archimedes' principle; laminar flow; Bernoulli's equation; temperature & temperature scales; thermal expansion; ideal gas; heat; heat capacity; latent heat; heat transfer.

**CIT3521 FUNDAMENTALS OF INFORMATION TECHNOLOGY I**

**Course Title:** **Fundamentals of Information Technology I**
**Course Code** **CIT3521**
**NQF Level** 5
**Notional Hours** 80
**NQF Credits** 8
**Course Assessment** Continuous Assessment **50%** (Minimum of 2 tests and 2 assignments) Examinations **50%**
**Contact Hours** 2 lecture periods per week and half a practical session per week for one semester
**Prerequisite** None
**Course Descriptions:** This course introduces pervasive Themes in Information Technology and covers the following topics: IT and Its Related Disciplines, Application Domains, History of the Internet; Communications media; Data transmission; Information technology security; Operating systems; Introduction to Web design and Web applications, Web technologies.

**FIRST AND SECOND SEMESTER COURSE**

**CONTEMPORARY SOCIAL ISSUES CSI3580**

| | |
|---|---|
| **Course title:** | **CONTEMPORARY SOCIAL ISSUES CSI3580** |
| **NQF:** | 5 |
| **Credits:** | 8 |
| **Continuous assessment:** | Continuous Assessment **100%**: Quizzes, Tests, Moodle Assignments, Journal Entries, Reflections, Service and Experiential Learning Projects |
| **Prerequisite:** | None |

**Course Content:** The module is designed to encourage behavioural change among UNAM students and inculcate the primacy of moral reasoning in their social relations and their academic lives. In providing students with critical and analytical thinking the module enables students to grow and develop into well rounded citizens, capable of solving contemporary social challenges experienced in their communities and societies. The teaching of the module takes three dimensions: the intellectual, the professional and the personal dimensions. The intellectual dimension is fostered through engaging students with subject knowledge, independent learning and module assessment. The professional dimension, on the other hand, is fostered through exposing students to real life situations of case studies and practical exercises that draws attention to social issues that attract on-going political, public and media attention and/or debate.

**SECOND SEMESTER COURSE**

**LEA3519 ENGLISH FOR ACADEMIC PURPOSES**

| | |
|---|---|
| **Course title:** | **ENGLISH FOR ACADEMIC PURPOSES** |
| **Code:** | **LEA3519** |
| **NQF level:** | 5 |
| **Contact hours:** | 4 periods per week for one semester |
| **Credits:** | 16 |
| **Course assessment:** | Continuous assessment (**60%**): 2 tests (reading and writing), 1 academic written essay, 1 oral presentation Examination **(40%)**: One three-hour examination paper |
| **Prerequisites:** | None |

**Course description:** This course develops a student's understanding, and competencies regarding academic conventions such as academic reading, writing, listening and oral presentation skills for academic purposes. Students are required to produce a referenced and researched essay written in formal academic style within the context of their university studies. Students are also required to do oral presentations based on their essays. The reading component of the course deals with academic level texts. This involves students in a detailed critical analysis of such texts. The main aim is therefore, to develop academic literacy in English.

**CIT3512 FUNDAMENTALS OF INFORMATION TECHNOLOGY II**

| | |
|---|---|
| **Course Title:** | **Fundamentals of Information Technology II** |
| **Course Code** | **CIT3512** |
| **NQF Level** | 5 |
| **NQF Credits** | 16 |
| **Contact Hours** | 4 lecture periods per week and onepractical session per week for one semester |
| **Course Assessment** | Continuous Assessment **50%** (Minimum of 2 tests and 2 assignments) Examinations **50%** |
| **Co-Requisites:** | CIT3521Fundamentals of Information Technology I |

**Course Descriptions:** This course is a follow up on Fundamentals of Information Technology I, and covers the following topics: Introduction to Data Communications; Introduction to Wired and wireless LAN technologies; Introduction to Telecommunications Systems; telecommunications standards and protocols; principles behind telecommunications; Networking fundamentals; Telecommunication Fundamentals; Industry standards, topologies and protocols;

**MAT3512 PRECALCULUS**

| | |
|---|---|
| **Course Code** | **MAT3512** |
| **NQF Level** | 5 |
| **Notional Hours** | 160 |
| **NQF Credits** | 16 |
| **Prerequisite** | None |
| **Contact Hours** | **4** lectures plus **1 x 2 hour** tutorial per week for one semester |

**Course description: Functions:** one-to-one, onto and bijective functions, horizontal line test, inverse of a function. **Combinations of functions:** composition of functions, sum, difference, quotient of functions and their domains. Polynomial functions, rational functions and their graphs. Introduction of exponential and logarithmic functions. Trigonometric functions and their graphs, inverse trigonometric functions, trigonometric equations. **Limit of a function:** definition, left and right limits, improper limits, continuity in terms of limits. **Differentiation:** rate of change, derivative of a function, rules of differentiation, derivatives of polynomial and rational functions, increasing and decreasing functions and graph sketching. **Integration:** Antiderivatives (polynomial functions and rational exponents), the definite integral, area under a graph.

**STS 3522 INTRODUCTION TO STATISTICS**

| | |
|---|---|
| **NQF Level:** | 5 |
| **Notional Hours:** | 80 |
| **NQF Credits:** | 8 |
| **Course assessment:** | Continuous assessment (at least two test and two assignments) **40%**; Examination **60%** (1x2hour Examination paper). |
| **Pre-requisite:** | Faculty entry requirements |
| **Compulsory/Elective** | Compulsory |
| **Contact hour:** | 2 lectures plus 1-hour tutorial per week/one semester |

**Course Description:** Terminologies used in statistics; Populations and samples as sources of data; The need for sampling; Probability and non-probability sampling techniques; Summarising data using frequency distributions and graphs; Computation of descriptive statistics for ungrouped and grouped data; Use of the scientific calculator.

**PHY3512: PHYSICS FOR PHYSICAL SCIENCES II**

| | |
|---|---|
| **Course Title:** | **PHYSICS FOR PHYSICAL SCIENCES II** |
| Code: | PHY3512 |
| **NQF Level:** | 5 |
| **Contact Hours:** | 56 Lectures and 14 Practical Sessions/Tutorials |
| **Credits:** | 16 |
| **Course assessment:** | Continuous Assessment (**50%**) and 1 x 3-hour Exam Paper (**50%**)<br>Continuous Assessment will consist of three (3) class tests, at least two (2) tutorial tests/assignments and practical report(s) consolidated to one (1) practical mark. |
| **Pre-requisites:** | None |
| **Co-requisites:** | PHY3511: Physics for Physical Sciences I |

**Course description:** This course introduces the phenomena associated with electrostatics (charges at rest) and magnetostatics (the magnetic effects associated with steady currents). It also introduces and develops the use of the electric and magnetic field vectors and relates them by considering electromagnetic induction at a classical level. The connection between these fields and conventional circuit parameters R, C and L is developed, together with the techniques to deal with elementary transient phenomena. Sound, basic geometrical optics and radioactivity and its detection are also covered. The contents of this course include: Electric charge; insulators and conductors; Electric force and coulomb's law, Electric field and Gauss's law; Electric potential; Capacitance and capacitors; Direct current; Ohm's law and simple circuits; Magnetic field; Alternating current; Transformers; Phenomenological approach to RL and RC circuits; Basic geometrical optics; Radioactivity and its detection; Sound.

**SECOND YEAR COURSES**

**FIRST SEMESTER COURSES**

**MAT3611 CALCULUS I**

| | |
|---|---|
| **Course Code:** | **MAT3611** |
| **NQF Level:** | 6 |
| **Notional Hours:** | 160 |
| **NQF Credits:** | 16 |
| **Prerequisite:** | MAT3512 |
| **Contact Hours:** | 4 lectures plus 2 tutorials per week for one semester |
| **Course Assessment:** | Continuous Assessment: 50% (minimum of 3 class tests). Examination: 50% (1 x 3-hour paper). |

**Course description: Limits and continuity of functions:** limit at a point, improper limits, continuity. **Derivatives:** definition, rules of differentiation, chain rule, derivatives of higher order, implicit differentiation, logarithmic differentiation, derivative of the inverse function, derivatives of exponential and logarithmic functions. **Some applications of the exponential functions:** growth and decay. Derivatives of arc functions (inverse trigonometric functions), derivatives of hyperbolic functions, derivatives of area functions (inverse hyperbolic functions). **Applications of the derivative**: extrema of functions, concavity and curve sketching, applications to optimization problems, related rates. Rolle's Theorem, The Mean Value Theorem, L'Hospital's rule. **Integration:** antiderivatives, integration by substitution.

**IAT3641 NUMERICAL METHODS WITH MATLAB**

| | |
|---|---|
| **Course Code:** | **MAT3641** |
| **NQF Level:** | 6 |
| **Notional Hours:** | 80 |
| **NQF Credits:** | 8 |
| **Prerequisite:** | MAT3521 |
| **Contact Hours:** | 2 lectures plus 1 tutorial per week for one semester |
| **Course Assessment:** | Continuous Assessment: **50%** (minimum of 2 class tests). Examination: **50%** (1 x 2-hour paper). |

**Course description: The MATLAB Environment:** arithmetic operations with MATLAB, matrix algebra with MATLAB, MATLAB scripts, matrix operators, graphic output, flow control, MATLAB functions, system of linear equations. **Numerical Methods:** system of non-linear equations, optimization, interpolation, regression, numerical differentiation, quadrature, differential equations. **Application:** dynamical systems, stochastic processes (e.g. throwing dice, tossing coins and dealing cards), discrete processes (e.g. population dynamics), continuous processes (e.g. chemical reactions and kinetics).

**PHY3651: MECHANICS & WAVES**

| | |
|---|---|
| **Course title:** | **MECHANICS & WAVES** |
| **Code:** | **PHY3651** |
| **NQF level:** | 6 |
| **Contact hours:** | 56 Lectures and 14 Practical Sessions/Tutorials |
| **Credits:** | 16 |
| **Course assessment:** | Continuous Assessment (**50%**) and 1 x 3-hour Exam Paper (**50%**)<br>Continuous Assessment will consist of three (3) class tests, at least two (2) assignments and practical report(s) consolidated to one (1) practical mark. |
| **Pre-requisites:** | PHY3511: Physics for Physical Sciences I and MAT3512: Precalculus |
| **Co-requisites:** | None |

**Course description:** Vectors, vector operations and the calculus of vectors. Rectilinear and curvilinear motion; Circular motion; Translational & rotational uniform relative motion; Mass; Linear momentum; Newton's Laws; Friction; The linear and quadratic laws of fluid drag; Variable mass systems; Angular momentum; Central forces; Work energy and power; Conservation laws; Rectilinear motion under conservative forces; Non-conservative forces; Centre of mass; Motion of the centre of mass. Linear and angular momentum of a system; Kinetic energy of a system; Conservation laws of a system; Transforming between Laboratory and Centre-of-mass Frames; Reduced mass; Collision Theory; Rutherford scattering; Angular momentum of a rigid body; Moments and products of inertia; Equation of motion for a rotating body; Kinetic energy of rotation; Body on a spring; Classical SHM; Damped SHM; Forced motion; The different kinds of waves; Standing waves on a string; The one dimensional wave equation; Travelling waves: properties; Plane waves; Scalar & vector waves; Reflection and transmission.

**ARM3641 HUMAN RESOURCES MANAGEMENT I**

| | |
|---|---|
| **Course title:** | **HUMAN RESOURCES MANAGEMENT I** |
| **Code:** | **ARM3641** |
| **NQF Level:** | 6 |
| **Contact hours:** | 2 lecture periods per week for one semester |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | None |

**Course description:** Human resources management in perspective, human resource function. Role: service, advisory and control. Environment: economic, social, political and technological. Current issues and human resource challenges. Human resources management in South Africa and Namibia.

**ARM3611 CONCEPTS AND TECHNIQUES IN MILITARY GEOGRAPHY IA**

| | |
|---|---|
| **Course title:** | **CONCEPTS AND TECHNIQUES IN MILITARY GEOGRAPHY IA** |
| **Code:** | **ARM3611** |
| **NQF level:** | 6 |
| **Contact hours:** | 4 lecture periods per week for one semester |
| **Credits:** | 16 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | **None** |
| **Corequisite:** | **None** |

**Course description:** The origin, nature and traditions of geography. Impact of man on the environment. Population, cultural, political, urban, economic and military geography. Geography of natural resources, regional concept and geography of spatial behaviour.

**ARM3601 PHYSICAL ENVIRONMENT I**

| | |
|---|---|
| **Course title:** | **PHYSICAL ENVIRONMENT I** |
| **Code:** | **ARM3601** |
| **NQF level:** | 6 |
| **Contact hours:** | 2 lecture periods per week for one semester and one three-hour practical session per week |
| **Credits:** | 8 |
| **Course assessment:** | Continuous Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | **None** |
| **Corequisites:** | **None** |

**Course description:** Earth: movements and seasons. The atmosphere: insulation, temperature, pressure, winds, moisture, flows and disturbance. Hydrosphere, Namibian weather and climate. Climatological data, synoptic weather charts and climogrammes.

**SECOND SEMESTER COURSES**

**MAT3612 CALCULUS II**

**Course Title:** **MAT3612**
**NQF Level:** 6
**Notional Hours:** 160
**NQF Credits:** 16
**Prerequisite :** MAT3512
**Contact Hours:** 4 lectures plus 2 tutorials per week for one semester
**Course Assessment:** Continuous Assessment: **50%** (minimum of 3 class tests). Examination: **50%** (1 x 3-hour paper)
**Course description: Integration:** Riemann sums and the definite integral, the Fundamental Theorem of Calculus, approximations of the Riemann integral using the trapezoidal rule and Simpson's rule, average value of a function on an interval. **Integration techniques:** integration by parts, reduction formulae, trigonometric substitutions, integration of rational functions. **Applications of the Riemann integral:** area of a region bounded by graphs, volume of a solid of revolution, arc length, surface of revolution. Partial differentiation, chain rule, directional derivatives. Classification of critical points for two-variable functions**. Sequences and series of real numbers:** the limit of a sequence, absolutely convergent series, tests of convergence. **Power series:** radius of convergence, interval of convergence, McLaurin and Taylor series, the Binomial Theorem. Double integration, iterated integrals, use of polar coordinates, application of double integration to finding area and volume. Improper integrals..

**MAT3642 ORDINARY DIFFERENTIAL EQUATIONS**

**Course Code:** **MAT3642**
**NQF Level:** 6
**Notional Hours:** 80
**NQF Credits:** 8
**Prerequisite :** MAT3521 and MAT3512
**Contact Hours:** 2 lectures plus 1 tutorial per week for one semester
**Course Assessment:** Continuous Assessment: **50%** (minimum of 2 class tests). Examination: **50%** (1 x 2-hour paper).

**Course description:** First order differential equations, linear differential equations of second order, series solutions of second order linear equations, The Laplace transform, systems of first order linear equations.

**PHY3612: ELECTROMAGNETISM**

**Course Title:** **ELECTROMAGNETISM**
**Code:** **PHY3612**
**NQF Level:** 6
**Credits:** 16
**Contact Time:** 56 Lectures and 14 Practical Sessions/Tutorials
**Course assessment:** Continuous Assessment (**50%**) and 1 x 3-hour Exam Paper (**50%**)
Continuous Assessment will consist of three (3) class tests, at least two (2) tutorial tests/assignments and practical report(s) consolidated to one (1) practical mark.
**Pre-requisites:** PHY3512: Physics for Physical Sciences II and MAT3512: Precalculus
**Co-requisites:** None
**Model description:** This course will provide students with information on how the charges at rest and those in motion behave. This course will be calculus-based and students will develop the skill to obtain different equations and solve related problems. The contents of the course are: Electric interaction; Static electric charge and Gauss's Law; Electric potential; Capacitors; Electric current; Ohm's law; Resistance, Joule effect and emf; Magnetic interaction; Lorentz force; Electromagnetic field of a moving charge; Electric flux of a moving charge; Magnetic field and electric current; Magnetostatics; Ampere's law; Time dependent electric field; Maxwell's equations.

**ARM3642 HUMAN RESOURCES MANAGEMENT II**

**Course title:** **HUMAN RESOURCES MANAGEMENT**
**Code:** **ARM3642**
**NQF level:** 6
**Contact hours:** 2 lecture periods per week for one semester
**Credits:** 8
**Course assessment:** Continuous Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper
**Prerequisites:** ARM3641
**Co-requisite:** None
**Course description:** Human resource management practice: recruitment, selection and placement practice. Human resources planning: strategy, process and evaluation. Factors affecting human resource: safety and health, merger, downsizing and changes in the world population demography**.**

**ARM3612 PHYSICAL ENVIRONMENT II**

| | |
|---|---|
| **Course title:** | **PHYSICAL ENVIRONMENT II** |
| **Code:** | **ARM3612** |
| **NQF Level:** | 6 |
| **Contact hours:** | 4 lecture periods per week for one semester and one 3 hours' practical session per week for one semester |
| **Credits:** | 16 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x3 hour theory paper |
| **Pre-requisites:** | **ARM3601** |
| **Co-requisite**: | None |

**Course description:** Internal structure of the earth: endogenesis of continental, sub-continental and regional scale. exogenetic processes: weather, mass wasting, fluvial, ground water and karst topography and wind in arid regions. Ocean processes: tides, waves, sea currents, coastal and landform. South African/Namibian geomorphology: landscape, terrain and contour. Stream orders, profiles, slopes and aerial photos.

**YEAR 3**

**FIRST SEMESTER COURSE**

| **PHY3711: ELECTRODYNAMICS** | |
|---|---|
| **Course title:** | **ELECTRODYNAMICS** |
| **Code:** | **PHY3711** |
| **NQF Level:** | 7 |
| **Contact hours:** | 56 Lectures and 14 Practical Sessions/Tutorials |
| **Credits:** | 16 NQF credits |
| **Course assessment:** | Continuous Assessment (**50%**) and 1 x 3-hour Exam Paper (**50%**)<br>Continuous Assessment will consist of three (3) class tests, at least two (2) tutorial tests/assignments and practical report(s) consolidated to one (1) practical mark. |
| **Pre-requisites:** | PHY3612: Electromagnetism and MAT3612: Calculus II |
| **Co-requisites:** | None |

**Course description:** The following topics are covered in Electrodynamics: Vector analysis, with emphasis on the 'del' operator , integral calculus, curvilinear coordinate systems; The electrostatic field E and its divergence and curl, Gauss's law; The electric potential, Poisson's equation and Laplace's equation; Work and energy in electrostatics, induced charges on conductors and capacitors; Uniqueness theorems and method of images as special techniques for solving some problems; The electric field of a dipole; Electric field in matter – polarization, linear dielectrics, electric displacement; Magnetostatics field B – Lorentz force law, Biot-Savart law, divergence and curl of B, Ampère's law, magnetic vector potential; Magnetic fields in matter – magnetization and the auxiliary field H; Electrodynamics – Ohm's law, Faraday's law, Maxwell's equations in vacuum and in matter, conservation laws, Poynting's theorem.

| **ARM3721** | **MILITARY PSYCHOLOGY** |
|---|---|
| **Course title:** | **MILITARY PSYCHOLOGY** |
| **Code:** | **ARM3721** |
| **NQA level:** | 7 |
| **Contact hours:** | 2 lecture periods per week for one semester |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | **NONE** |

**Course description:** Personality theory and war: role of personality and personality theory of Jung, adjustment psychology: maladjustment and adolescent, transition in military training. Operational psychology: psychological effects of combat, post-traumatic stress disorder. Peacekeeping psychology: model to support soldiers and their dependants, stressors and prisoner of war. Psychological warfare: ethics in war operations.

| **ARM3741** | **MILITARY MANAGEMENT** |
|---|---|
| **Course title:** | **MILITARY MANAGEMENT** |
| **Code:** | **ARM3741** |
| **NQA level:** | 7 |
| **Contact hours:** | 2 lecture periods per week for one semester |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | **NONE** |

**Course description:** Management: general, environment and diversity. Planning: skills, creative problem solving, strategy and operational processes and organising skills. Organising and delegation; management of change; Leadership skills; group and team development, power, conflict and stress, control of human resources and finance controls in organization.

| **ARM3761** | **MILITARY HISTORY** |
|---|---|
| **Course title:** | **MILITARY HISTORY** |
| **Code:** | **ARM3761** |
| **NQA level:** | 7 |
| **Contact hours:** | 2 lecture periods per week for one semester |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment 50%: Examination 50%: 1x2 hour theory paper |
| **Prerequisites:** | **NONE** |

**Course description:** South African defence force from 1957 – 1994, South African defence and imperial defence, integration and transformation of the SANDF since 1994, the NDF since 1990, the South African/ Namibian military historiography, history and establishment of the Union Defence Force, internal conflict between Voortrekers, Matebele and the Zulus, military power and white supremacy/hegemony, rise of black resistance in the twenty centaury.

| **ARM3711** | **MILITARY CONDUCT AND ENVIRONMENT** |
|---|---|
| **Course title:** | **MILITARY CONDUCT AND ENVIRONMENT** |
| **Code:** | **ARM3711** |
| **NQA level:** | 7 |
| **Contact hours:** | 4 lecture periods per week for one semester and one 3-hour practical session per week for one semester. |
| **Credits:** | 16 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x3 hour theory paper |
| **Prerequisites:** | ARM3611 |

**Course description:** Military actions. Environment: theories and systems. Environmental: management, resources, conflict, urban and related problems. Law: South African and Namibian. Data capturing techniques: sampling techniques, questionnaires and workshops. Data processing and interpretation. Procedure for the environmental impact assessment

**SECOND SEMESTER COURSES**

| **ARM3732** | **AFRICA AND INTERNATIONAL POLITICAL ECONOMY** |
|---|---|
| **Course title:** | **AFRICA AND INTERNATIONAL POLITICAL ECONOMY** |
| **Code:** | **ARM3732** |
| **NQA level:** | 7 |
| **Contact hours:** | 4 lecture periods per week for one semester |
| **Credits:** | 16 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x3 hour theory paper |
| **Prerequisites:** | NONE |

**Course description:** Political economy: characteristics of the world economic system, the evolution of the international political economy, Africa's contemporary economic history. Internal and external causes of economic decline in Africa, the NEPAD strategy, successful states in the Developing World, U.S.A. foreign aid after September 11, war economies: The U.S.A, China and Africa in contemporary-political economic context. The role of natural resource conflict: Sudan, Angola and Sierra Leone.

| **PHY3752 MODERN PHYSICS** | |
|---|---|
| **Course title:** | **MODERN PHYSICS** |
| **Code:** | **PHY3752** |
| **NQF Level:** | 7 |
| **Contact hours:** | 56 Lectures and 14 Practical Sessions/Tutorials |
| **Credits:** | 16 |
| **Course assessment:** | Continuous Assessment (**50%**) and 1 x 3-hour Exam Paper (**50%**)<br>Continuous Assessment will consist of three (3) class tests, at least two (2) tutorial tests/assignments and practical report(s) consolidated to one (1) practical mark. |
| **Pre-requisites:** | MAT3612: Calculus II and **either** PHY3651: Mechanics & Waves or PHY3612: Electromagnetism |
| **Co-requisites:** | None |

**Course description:** The Birth of Modern Physics: Classical physics of the 1890s, nature of light, the initial atomic theory of matter, problems in 19th-century physics;Special Theory of Relativity: The need for aether, the Michelson-Morley experiment, Einstein's postulates, Lorentz transformation, time dilation and length contraction, addition of velocities, experimental verifications, the twin paradox, space-time and Minkowski diagrams, doppler effect, relativistic momentum, relativistic energy, electromagnetism and relativity, four vectors;Overview of General Relativity：A brief and qualitative descriptive view of: tenets of: General Relativity, tests of General Relativity, gravitational waves, black holes, and frame dragging;Experimental Basis of Quantum Theory: discovery of the X-ray and the Electron, determination of the electron charge, line spectra, blackbody radiation, photoelectric effect, Compton effect;Structure of the Atom: atomic models of Thomson and Rutherford, Rutherford scattering, the classic atomic model, the Bohr Model of the hydrogen atom, successes and failures of the Bohr model, Mosley's law, Franck-Hertz experiment;Wave Properties of Matter and Quantum Mechanics: X-ray scattering, De Broglie waves, electron scattering, particle-wave duality, Heisenberg uncertainty relation, probability, wave functions, the Schrödinger wave equation, expectation values, infinite square-well potential, finite square-well Potential, barriers and tunneling, quantum numbers, Zeeman effect, Lande g factor, spin-orbit interaction;Lasers: stimulated emission, gain and inversion, rate equations, three- and four-level systems, threshold energy, laser applications.

| ARM3712 | GEOGRAPHY OF SUB-SAHARAN AFRICA |
|---|---|
| **Course title:** | **GEOGRAPHY OF SUB-SAHARAN AFRICA** |
| **Code:** | **ARM3712** |
| **NQA level:** | 7 |
| **Contact hours:** | 4 lecture periods per week for one semester and one 3-hour practical session per week for one semester. |
| **Credits:** | 16 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x3 hour theory paper |
| **Prerequisites:** | ARM3611 |

**Course description:** Landscape: physical and polilical. Geography: population, medical and urban. Historical background: culture, conflict and change. Agriculture development, human impact on the environment, natural resources, Geographical report writing about the region.

| ARM3772 | CONTEMPORARY POLITICAL RELATIONS |
|---|---|
| **Course title:** | **CONTEMPORARY POLITICAL RELATIONS** |
| **Code:** | **ARM3772** |
| **NQA level:** | 7 |
| **Contact hours:** | 4 lecture periods per week for one semester |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x3 hour theory paper |
| **Prerequisites:** | **NONE** |

**Course description:** Foreign policy, decision making, models of foreign policy, international crises, theory of foreign policy, of cultures and political arrangement on the outcomes of foreign policies.

| AER3732 | RESEARCH METHODOLOGY |
|---|---|
| **Course title:** | **RESEARCH METHODOLOGY** |
| **Code:** | **AER3732** |
| **NQA level:** | 7 |
| **Contact hours:** | 2 lecture periods per week for one semester |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | STS3522 |

**Course description:** Various philosophy of science, research proposals (guidance to write good project proposals). Basic research skills (e.g., library research, literature review, article analysis, etc.,). Research strategy: planning, designing and implementing. Data collection and interpretation methods, data reduction, error analysis (error propagation). Data analysis, report writing, communication, skill required to communicate research findings to a broader audience, presentations, (oral and written). Peer reviewing, refereed Journals, ethics and legal issues (e.g. Plagiarism). Basic quantitative research (concerned with the tabulation or numeric relevance of various kinds of behavior (measuring). Basic of qualitative research.

**YEAR 4**

**FIRST AND SECOND SEMESTER COURSE**

| **ARM3810** | **RESEARCH PROJECT** |
|---|---|
| **Course title:** | **RESEARCH PROJECT** |
| **Code:** | **ARM3810** |
| **NQA level:** | 8 |
| **Contact hours:** | 2 consultation periods per week for one semester |
| **Credits:** | 32 |
| **Course assessment:** | Continuous assessment: 100% (Oral presentation of research proposal – 10%; written research proposal – 20%, oral presentation of results – 20%, written research report - 50%) |
| **Prerequisites:** | AER3732 |
| **Course description:** | Identification of research topic; literature review, data collection, analysis, proposal development, presentation, evaluation and report writing. |

**FIRST SEMESTER COURSES**

| **PHY3809: ADVANCED ELECTRODYNAMICS** | |
|---|---|
| **Course title:** | **ADVANCED ELECTRODYNAMICS** |
| **Code:** | **PHY3809** |
| **NQF Level:** | 8 |
| **Contact hours:** | 28 Lectures and 7 Practical Sessions/Tutorials |
| **Credits:** | 8 NQF credits |
| **Course assessment:** | Continuous Assessment (**50%**) and 1 x 2-hour Exam Paper (**50%**)<br>Continuous Assessment will consist of two (2) class tests, at least two (2) assignments and practical report(s) and/or presentation(s) consolidated to one (1) practical mark |
| **Pre-requisites:** | PHY3711: Electrodynamics |
| **Co-requisites:** | None |

**Course description:** This course is a follow-up on the course Electrodynamics and constitute the following topics: Conservation laws in electrodynamics; Vector and scalar potential formulation; Coulomb and Lorentz transformations; Retarded potentials and Jefimenko's equations; Lièнard-Wiechert potentials; Electric and magnetic dipole radiation, power radiated; Linear Antennas; Electrodynamics and relativity – relativistic magnetism, field transformation, field tensor.

| **ARM3831** | **MILITARY LEADERSHIP** |
|---|---|
| **Course title:** | **MILITARY LEADERSHIP** |
| **Code:** | **ARM3831** |
| **NQA level:** | 8 |
| **Contact hours:** | 4 lecture periods per week for one semester |
| **Credits:** | 16 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x3 hour theory paper |
| **Prerequisites:** | ARM3741 |

**Course description:** Leadership ethics, types and style of leadership, roles and ethics of commander, obedience and order, application of military ethics, code of conduct of the NDF and the Constitution of Namibia.

| **ARM3851** | **ECONOMICS I** |
|---|---|
| **Course title:** | **ECONOMICS I** |
| **Code:** | **ARM3851** |
| **NQA level:** | 8 |
| **Contact hours:** | 4 lecture periods per week for one semester |
| **Credits:** | 16 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x3 hour theory paper |
| **Prerequisites:** | None |

**Course description: Micro-economics: O**verview of economic systems. **The**or**y:** demand and supply. **Elasticity:** price, income, demand and supply. **Background:** utility, consumer equilibruim, budget line. **Production the**or**y and cost**: basic cost and profit cost, long run and short run cost. **Market structure**: monopoly, oligopoly, comparison of monopoly imperfect and perfect competition. Government intervention. **Macro-economic**: policy objectives and economic analytical models. **Public sect**or: role of goverment in economy, government intervention and market failure, spending and taxation. **Monetary policie**s: money, financial intermediaries, demand and supply of money, instrument of monetary policy. **Defence economics**: functions of the defence industry, national and defence budgets, economic warfare, labour economics. **Economic systems and thoughts**: capitalism, socialism, mixed economy, pre-clasical and neo-clasical thought.

| ARM3811 | GEOGRAPHICAL INFORMATION SYSTEMS |
|---|---|
| **Course title:** | **GEOGRAPHICAL INF**OR**MATION SYSTEMS** |
| **Code:** | **ARM3811** |
| **NQA level:** | 8 |
| **Contact hours:** | 4 lecture periods per week for one semester and one 3-hour practical session per week for one semester. |
| **Credits:** | 16 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x3 hour theory paper |
| **Prerequisites:** | ARM3712 |
| Co-requiste: | ARM3852 |

**Course description:** Overview of geographic information systems (GIS). Fundamental geographical concepts for GIS-Science.Geographic information system technology in the military. Digital geographical data: capturing, storing, retrieval, manipulation, querying and displaying of data.

**SECOND SEMESTER COURSES**

| PHY3802: NUCLEAR PHYSICS | |
|---|---|
| **Course title:** | **NUCLEAR PHYSICS** |
| **Code:** | **PHY3802** |
| **NQF Level:** | 8 |
| **Contact hours:** | 28 Lectures and 7 Practical Sessions/Tutorials |
| **Credits:** | 8 |
| **Course assessment:** | Continuous Assessment (**50%**) and 1 x 2-hour Exam Paper (**50%**)<br>Continuous Assessment will consist of two (2) class tests, at least two (2) assignments and practical report(s) and/or presentation(s) consolidated to one (1) practical mark |
| **Pre-requisites:** | PHY3752: Modern Physics |
| **Co-requisites:** | None |

**Course description::** Nuclear Structure, nuclear radius, nomenclature; Decay of the nucleus, alpha decay, beta decay, gamma decay, spontaneous fission; Radioactivity, radioactive growth and decay, transient equilibrium, secular equilibrium, radioactive decay series, carbon dating; Chart of Nuclides; Nuclear reactions, elastic scattering, inelastic scattering, reaction of transmutation, radiative capture, photodisintegration, induced fission; Interaction of radiation with matter, photoelectric effect, pair production, Compton scattering, calculation of energy transferred in Compton scattering using relativistic equations; The liquid drop model, variation of binding energy per nucleon with mass number; Weizsacher's semi-empirical mass formula; The shell model; Nuclear energy, nuclear reactors, introductory reactor physics, nuclear power plants; Nuclear instrumentation, radiation detectors, accelerators; Two body systems and nuclear force: properties of nuclear forces, the deuteron, qualitative treatment of n-p and p-p scattering at low energies; Elementary particle.

| ARM3872 | ECONOMICS II |
|---|---|
| **Course title:** | **ECONOMICS II** |
| **Code:** | **ARM3872** |
| **NQA level:** | 8 |
| **Contact hours:** | 4 lecture periods per week for one semester |
| **Credits:** | 16 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x3 hour theory paper |
| **Prerequisites:** | ARM3851 |

**Course description:** Iinternational trade: comperative and absolute advantage. Instrument of trade policy: tariffs, quatas, subsidies, administrative policies, antidumping, local content requirements, goverment intervention. Balance of payment accounts: current and financial. Exchange: foreign markets, foreign exchange policy or regimes, goverment intervention. International finace and debts crisis. Terms of trade: ratio of import and export price. Economic development: measurement of economic growth, business cycle and sources of economic growth.

| ARM3852 | REMOTE SENSING |
|---|---|
| **Course title:** | **REMOTE SENSING** |
| **Code:** | **ARM3852** |
| **NQA level:** | 8 |
| **Contact hours:** | 4 lecture periods per week for one semester and one 3-hour practical session per week for one semester. |
| **Credits:** | 16 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x3 hour theory paper |
| **Prerequisites:** | ARM3811 & ARM3712 |

**Course description:** Electromagnetic energy, remote sensing, sensors and platform. Radiometric correction and geometric aspects of remote sensing. Image enhancement and visualisation. Visual image interpretation and digital classification.

## D.4. BACHELOR OF SCIENCE IN MILITARY SCIENCE (AERONAUTICAL) HONOURS

**Qualification: BSc Honours Military Science Aeronautical 21BMSR**

Students opting for a Military Science (Aeronautical) must take all of the following courses:

**YEAR 1**

| SEMESTER | MODULE NAME | COURSE CODE | CREDITS | PRE-REQUISITES | CO-REQUISITES |
|---|---|---|---|---|---|
| 1 | English Communication & Study Skills | LCE 3419 | 16 | None | None |
| 1 | Basic Mathematics | MAT3511 | 16 | None | None |
| 1 | Computer Literacy | CLC3509 | 8 | None | None |
| 1 | Analytic Geometry | MAT3501 | 8 | None | None |
| 1 | Matrices and Complex Numbers | MAT3521 | 8 | None | None |
| 1 | Physics for Physical Sciences I | PHY3511 | 16 | None | None |
| 1 | Fundamentals of Information Technology I | CIT3521 | 8 | None | None |
| 2 | English for Academic Purposes | LEA3519 | 16 | None | LCE3419 |
| 1&2 | Contemporary Social Issues | CSI3580 | 8 | None | None |
| 2 | Fundamentals of Information Technology II | CIT3512 | 16 | None | SCIT3521 |
| 2 | Precalculus | MAT3512 | 16 | None | None |
| 2 | Introduction to Statistics | STS3522 | 8 | None | None |
| 2 | Physics for Physical Sciences II | PHY3512 | 16 | None | None |
| **Total Credits** | | | **160** | | |

**YEAR 2**

| SEMESTER | MODULE NAME | COURSE CODE | CREDITS | PRE-REQUISITES | CO-REQUISITES |
|---|---|---|---|---|---|
| 1 | Calculus I | MAT3611 | 16 | MAT3512 | None |
| 1 | Numerical Methods with MATLAB | MAT3641 | 8 | MAT3521 | None |
| 1 | Mechanics and Waves | PHY3651 | 16 | MAT3512 & PHY3511 | None |
| 1 | Fundamentals of Physical Geography | AER3631 | 16 | None | None |
| 1 | Theory of Flight I | AER3621 | 8 | None | None |
| 2 | Calculus II | MAT3612 | 16 | MAT3512 | None |
| 2 | Ordinary Differential Equations | MAT3642 | 8 | MAT3521and MAT3512 | None |
| 2 | Electromagnetism | PHY3612 | 16 | PHY3512 &MAT3512 | None |
| 2 | Theory of Flight II | AER3612 | 16 | AER3621 | None |
| 2 | Flight Physiology | AER3642 | 8 | None | AER3621 |
| **Total Credits** | | | **128** | | |

**YEAR 3**

| SEMESTER | MODULE NAME | MODULE CODE | CREDITS | PRE-REQUISITES | CO-REQUISITES |
|---|---|---|---|---|---|
| 1 | Electrodynamics | PHY3711 | 16 | PHY3612 & MAT3612 | None |
| 1 | History of Aviation | AER3721 | 8 | None | None |
| 1 | Military Management | ARM3741 | 8 | None | None |
| 1 | Military Psychology | ARM3721 | 8 | None | None |
| 1 | Airport Planning and Management | AER3751 | 16 | None | None |
| 1 | Theory of Flight III | AER3711 | 16 | AER3612 & AER3621 | None |
| 2 | Modern Physics | PHY3752 | 16 | MAT3612 and either PHY3651 or PHY3612 | None |
| 2 | Research Methodology | AER3732 | 8 | STS3522 | None |
| 2 | Aviation Management Principles | AER3702 | 8 | None | ARM3741 |
| 2 | Aviation Ethics | AER3722 | 8 | None | ARM3721 |
| 2 | Aviation Laws and Regulations | AER3742 | 8 | None | AER3751 |
| 2 | Aircraft Turbine Engine Operation | AER3762 | 8 | None | AER3711 |
| **Total Credits** | | | **128** | | |

**YEAR 4**

| SEMESTER | MODULE NAME | MODULE CODE | CREDITS | PRE-REQUISITES | CO-REQUISITES |
|---|---|---|---|---|---|
| 1&2 | Research Project | AER3810 | 32 | AER3732 | None |
| 1 | Advanced Electrodynamics | PHY3809 | 8 | PHY3711 | None |
| 1 | Aviation Safety | AER3811 | 16 | None | AER3702 |
| 1 | Advanced Aircraft Performance | AER3831 | 16 | None | AER3762 |
| 1 | Crew Resource Management in Aviation | AER3821 | 8 | AER3742 | None |
| 2 | Nuclear Physics | PHY3802 | 8 | PHY3752 | None |
| 2 | Aviation Navigation GPS | AER3812 | 16 | AER3742 | None |
| 2 | Aviation Leadership | AER3822 | 8 | AER3722 | None |
| 2 | Aviation-Aerospace Security Issues | AER3842 | 8 | AER3722 | None |
| 2 | Aviation Terrorism and Asymmetrical Warfare | AER3862 | 8 | None | AER3811 |
| **Total Credits** | | | **128** | | |

*D.4.1 BACHELOR OF SCIENCE IN MILITARY SCIENCE (AERONAUTICAL) HONOURS COURSE DESCRIPTION*

**FIRST YEAR COURSES**

**FIRST SEMESER COURSES**

**LCE3419 ENGLISH COMMUNICATION & STUDY SKILLS**

| | |
|---|---|
| **Course title:** | **ENGLISH COMMUNICATION AND STUDY SKILLS** |
| **Code:** | **LCE3419** |
| **NQF Level:** | 4 |
| **Contact hours:** | 4 hours per week for one semester |
| **Credits:** | 16 |
| **Course Assessment:** | Continuous assessment (60%): two tests (reading and writing), two reading assignments, one oral presentation Examination (40%): one 3-hour examination paper |
| **Pre-requisites:** | None |

**Course description:** This course is aimed at assisting students in the development of their reading, writing and speaking and listening skills, in order to cope with studying in a new academic environment and in a language which may not be their first language. The course also focuses on study skills that students need throughout their academic careers and beyond. The course serves as an introduction to university level academics, where styles of teaching and learning differ from those at secondary schools in that more responsibility is placed on the student. The course therefore, focuses on the skills that students need throughout their academic careers and beyond.

**MAT3511 BASIC MATHEMATICS**

| | |
|---|---|
| **Course Code** | MAT3511 |
| **NQF Level** | 5 |
| **Notional Hours** | 160 |
| **NQF Credits** | 16 |
| **Prerequisite** | None |
| **Contact Hours** | 4 lectures plus **2** tutorials per week for one semester |

**Course Assessment:** Continuous Assessment: **50%** (minimum of 3 class tests). Examination: **50%** (1 x 3-hour paper).

**Course description: Algebraic expressions:** Simplification, expansion, factorization, polynomials, remainder and factor theorem, quadratic polynomial. Binomial expansions, Pascal's triangle and the Binomial Theorem.Rational expressions, partial fractions. **Equations and inequalities:** Linear equations in one-variable, simultaneous linear equations, quadratic equations, simultaneous non-linear equations. Linear inequalities, non-linear inequalities. **Sets:** What is a set? Set notation, equality of sets, subsets, characterization of equality via the subset relation, empty set, power sets, Venn diagrams, intersection, union, complement, de Morgan's laws, set difference, symmetric difference, proofs of *simple results* on set equality. Standard examples of sets: natural numbers, integers, rationals, real numbers. Absolute value, intervals in R. A bit about cardinality of sets (examples of finite, *infinite, countable, uncountable sets)*. **Trigonometry:** Trigonometric ratios, angle orientation in the *xy*-plane, graphs of trigonometric functions, trigonometric identities, justifying (proving) equality of relatively simple trigonometric expressions. Sum/difference, double angle, half angle and sum to product formulas. **Sequences:** Definition, notation, obtaining the general term in sequences, arithmetic sequences, geometric sequences, recursively defined sequences.

**CLC3509 COMPUTER LITERACY**

| | |
|---|---|
| **Course title:** | **COMPUTER LITERACY** |
| **Code:** | **CLC3509** |
| **NQF level:** | 4 |
| **Contact hours:** | 1 lecture theory and 1 lecture practical per week for one semester |
| **Credits:** | 8 |
| **Course assessment:** | Continuous Assessment **100%**: 2 Practical Tests **50%**, 2 Theory Tests **50%** |
| **Prerequisites:** | None |

**Course description:** The aim of this course is to equip the students through hands-on experience with the necessary skills to use application software: word processing, spreadsheets, databases, presentations and communications. The objective is to increase student's productivity in both the education and later, the work environment.

**Content:** The course covers the following topics. Introduction to Computers: hardware and software, types and categories of computers, usage of Computer devices and peripherals. Working with the windows operating system: File Management, working with multiple programs, using the recycle bin. Using a word processor: formatting a text and documents, spelling check, grammar and thesaurus tools, inserting tables, auto-shapes, clip arts, charts, and mail merge. Spreadsheet: worksheets and workbooks, ranges, formulas and functions, creating graphs, charts, and printing the workbook. Databases: creating tables, relationships, queries, forms and reports. Presentation software: slide layout and master, animations, auto-content wizard and templates. Communication tools: introduction to the Internet, web browsers, search engines, downloading and uploading files, creating and sending messages, email etiquette, internet security, and digital signatures.

**MAT3501 ANALYTIC GEOMETRY (MAT3520 ANALYTIC GEOMETRY A)**

**Course Code:** **MAT3501**
**NQF Level:** 5
**Notional Hours:** 80
**NQF Credits:** 8
**Prerequisite:** None
**Contact Hours:** 2 lectures plus 1 tutorial per week for one semester
**Course Assessment:** Continuous Assessment: 50% (minimum of 2 class tests). Examination: 50% (1 x 2-hour paper).
**Course description: Introduction:** Lines, circles and tangent lines. **Conic sections:** ellipse, parabola, hyperbola. Translation and rotation of the axes. **Parametric equations:** circle, ellipse, Parabola, Hyperbola, cycloids. **Polar coordinates:** definition, relating polar and Cartesian coordinates, Conic sections in polar coordinates. **Surfaces and quadrics:** Spheres, cylinders, ellipsoids, paraboloids, hyperboloids, cones. Spherical and cylindrical coordinates.

**MAT3521 MATRICES AND COMPLEX NUMBERS (MAT3540 MATRICES AND COMPLEX NUMBERS A)**

**Course Code:** **MAT3521**
**NQF Level:** 5
**Notional Hours:** 80
**NQF Credits:** 8
**Prerequisite:** None
**Contact Hours:** 2 lectures plus 1 tutorial per week for one semester
**Course Assessment:** Continuous Assessment: 50% (minimum of 2 class tests). Examination: 50% (1 x 2-hour paper).
**Course description: Vectors in 2-and 3-dimensions:** addition of vectors, multiplication by a scalar, norm of a vector, dot product, cross product. Lines and planes in 3D-space. **Systems of linear equations:** introduction to linear systems, solution by Gaussian elimination and Gauss–Jordan elimination (for up to 3 x 3). **Matrices:** addition, multiplication, scalar multiplication, transpose (for up to 3 x 3), elementary matrices, diagonal, triangular and symmetric matrices, determinant and inverse (for up to 3 x 3), solutions of systems of linear equations by Cramer's rule (for up to 3 x 3). **Complex Numbers:** complex planes, operations on complex numbers, modulus, complex conjugate, division, modulus-argument form, de Moivre's formula, Euler's formula, Fundamental Theorem of Algebra.

**PHY3511: PHYSICS FOR PHYSICAL SCIENCES I**

**Course title:** **PHYSICS FOR PHYSICAL SCIENCES I**
**Code:** **PHY3511**
**NQF level:** 5
**Contact hours:** 56 Lectures and 14 Practical Sessions/Tutorials
**Credits:** 16
**Course assessment:** Continuous Assessment (**50%**) and 1 x 3-hour Exam Paper (**50%**)
Continuous Assessment will consist of three (3) class tests, at least two (2) tutorial tests/assignments and practical report(s) consolidated to one (1) practical mark.
**Pre-requisites:** NSSC Physical Science and Mathematics (C-symbols)
**Co-requisites:** None
**Course description:** Units, significant figures & scientific notation; vectors: properties, components, unit vectors, products; average & instantaneous speed, velocity and acceleration; one dimensional motion with constant acceleration; falling bodies; two dimensional motion with constant acceleration; projectile motion; uniform circular motion; circular motion; relative velocity and acceleration; Newton's laws; inertial frames; weight; friction; applications; work and kinetic energy; power; conservative and non-conservative forces; gravitational potential energy; conservation theorem; work-energy theorem; linear momentum & impulse; conservation of linear momentum - 2 particle system; collisions; equilibrium; centre of gravity; applications; Newtonian gravitation; gravitational constant; weight & gravitational force; Kepler's laws; pressure; Archimedes' principle; laminar flow; Bernoulli's equation; temperature & temperature scales; thermal expansion; ideal gas; heat; heat capacity; latent heat; heat transfer.

**CIT3521 FUNDAMENTALS OF INFORMATION TECHNOLOGY I**

**Course Title:** **Fundamentals of Information Technology I**
**Course Code** **CIT3521**
**NQF Level** 5
**Notional Hours** 80
**NQF Credits** 8
**Course Assessment** Continuous Assessment **50%** (Minimum of 2 tests and 2 assignments) Examinations **50%**
**Contact Hours** 2 lecture periods per week and half a practical session per week for one semester
**Prerequisite** None
**Course Descriptions:** This course introduces pervasive Themes in Information Technology and covers the following topics: IT and Its Related Disciplines, Application Domains, History of the Internet; Communications media; Data transmission; Information technology security; Operating systems; Introduction to Web design and Web applications, Web technologies.

**LEA3519 ENGLISH FOR ACADEMIC PURPOSES**

| | |
|---|---|
| **Course title:** | **ENGLISH FOR ACADEMIC PURPOSES** |
| **Code:** | **LEA3519** |
| **NQF level:** | 5 |
| **Contact hours:** | 4 periods per week for one semester |
| **Credits:** | 16 |
| **Course assessment:** | Continuous assessment (**60%**): 2 tests (reading and writing), 1 academic written essay, 1 oral presentation Examination **(40%)**: One three-hour examination paper |
| **Prerequisites:** | None |

**Course description:** This course develops a student's understanding, and competencies regarding academic conventions such as academic reading, writing, listening and oral presentation skills for academic purposes. Students are required to produce a referenced and researched essay written in formal academic style within the context of their university studies. Students are also required to do oral presentations based on their essays. The reading component of the course deals with academic level texts. This involves students in a detailed critical analysis of such texts. The main aim is therefore, to develop academic literacy in English.

**FIRST AND SECOND SEMESTER COURSE**

**CONTEMPORARY SOCIAL ISSUES CSI3580**

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|---|---|
| **Course title:** | **CONTEMPORARY SOCIAL ISSUES CSI3580** |
| **NQF:** | 5 |
| **Credits:** | 8 |
| **Continuous assessment:** | Continuous Assessment **100%**: Quizzes, Tests, Moodle Assignments, Journal Entries, Reflections, Service and Experiential Learning Projects |
| **Prerequisite:** | None |

**Course Content:** The module is designed to encourage behavioural change among UNAM students and inculcate the primacy of moral reasoning in their social relations and their academic lives. In providing students with critical and analytical thinking the module enables students to grow and develop into well rounded citizens, capable of solving contemporary social challenges experienced in their communities and societies. The teaching of the module takes three dimensions: the intellectual, the professional and the personal dimensions. The intellectual dimension is fostered through engaging students with subject knowledge, independent learning and module assessment. The professional dimension, on the other hand, is fostered through exposing students to real life situations of case studies and practical exercises that draws attention to social issues that attract on-going political, public and media attention and/or debate.

**SECOND SEMESTER COURSES**

**CIT3512 FUNDAMENTALS OF INFORMATION TECHNOLOGY II**

| | |
|---|---|
| **Course Title:** | **Fundamentals of Information Technology II** |
| **Course Code** | **CIT3512** |
| **NQF Level** | 5 |
| **NQF Credits** | 16 |
| **Contact Hours** | 4 lecture periods per week and onepractical session per week for one semester |
| **Course Assessment** | Continuous Assessment **50%** (Minimum of 2 tests and 2 assignments) Examinations **50%** |
| **Co-Requisites:** | CIT3521Fundamentals of Information Technology I |

**Course Descriptions:** This course is a follow up on Fundamentals of Information Technology I, and covers the following topics: Introduction to Data Communications; Introduction to Wired and wireless LAN technologies; Introduction to Telecommunications Systems; telecommunications standards and protocols; principles behind telecommunications; Networking fundamentals; Telecommunication Fundamentals; Industry standards, topologies and protocols;

**MAT3512 PRECALCULUS**

| | |
|---|---|
| **Course Code** | **MAT3512** |
| **NQF Level** | **5** |
| **Notional Hours** | **160** |
| **NQF Credits** | **16** |
| **Prerequisite** | **None** |
| **Contact Hours** | **4** lectures plus **1 x 2 hour** tutorial per week for one semester |

**Course description: Functions:** one-to-one, onto and bijective functions, horizontal line test, inverse of a function. **Combinations of functions:** composition of functions, sum, difference, quotient of functions and their domains. Polynomial functions, rational functions and their graphs. Introduction of exponential and logarithmic functions. Trigonometric functions and their graphs, inverse trigonometric functions, trigonometric equations. **Limit of a function:** definition, left and right limits, improper limits, continuity in terms of limits. **Differentiation:** rate of change, derivative of a function, rules of differentiation, derivatives of polynomial and rational functions, increasing and decreasing functions and graph sketching. **Integration:** Antiderivatives (polynomial functions and rational exponents), the definite integral, area under a graph.

**STS 3522 INTRODUCTION TO STATISTICS**

| | |
|---|---|
| **NQF Level:** | 5 |
| **Notional Hours:** | 80 |
| **NQF Credits:** | 8 |
| **Course assessment:** | Continuous assessment (at least two test and two assignments) **40%**; Examination **60%** (1x2hour Examination paper). |
| **Pre-requisite:** | Faculty entry requirements |
| **Compulsory/Elective** | Compulsory |
| **Contact hour:** | 2 lectures plus 1-hour tutorial per week/one semester |

**Course Description:** Terminologies used in statistics; Populations and samples as sources of data; The need for sampling; Probability and non-probability sampling techniques; Summarising data using frequency distributions and graphs; Computation of descriptive statistics for ungrouped and grouped data; Use of the scientific calculator.

**PHY3512: PHYSICS FOR PHYSICAL SCIENCES II**

| | |
|---|---|
| **Course Title:** | PHYSICS FOR PHYSICAL SCIENCES II |
| Code: | PHY3512 |
| **NQF Level:** | 5 |
| **Contact Hours:** | 56 Lectures and 14 Practical Sessions/Tutorials |
| **Credits:** | 16 |
| **Course assessment:** | Continuous Assessment (**50%**) and 1 x 3-hour Exam Paper (**50%**)<br>Continuous Assessment will consist of three (3) class tests, at least two (2) tutorial tests/assignments and practical report(s) consolidated to one (1) practical mark. |
| **Pre-requisites:** | None |
| **Co-requisites:** | PHY3511: Physics for Physical Sciences I |

**Course description:** This course introduces the phenomena associated with electrostatics (charges at rest) and magnetostatics (the magnetic effects associated with steady currents). It also introduces and develops the use of the electric and magnetic field vectors and relates them by considering electromagnetic induction at a classical level. The connection between these fields and conventional circuit parameters R, C and L is developed, together with the techniques to deal with elementary transient phenomena. Sound, basic geometrical optics and radioactivity and its detection are also covered. The contents of this course include: Electric charge; insulators and conductors; Electric force and coulomb's law, Electric field and Gauss's law; Electric potential; Capacitance and capacitors; Direct current; Ohm's law and simple circuits; Magnetic field; Alternating current; Transformers; Phenomenological approach to RL and RC circuits; Basic geometrical optics; Radioactivity and its detection; Sound.

**SECOND YEAR COURSES**

**FIRST SEMESTER COURSES**

**MAT3611 CALCULUS I**

| | |
|---|---|
| **Course Code:** | **MAT3611** |
| **NQF Level:** | 6 |
| **Notional Hours:** | 160 |
| **NQF Credits:** | 16 |
| **Prerequisite:** | MAT3512 |
| **Contact Hours:** | 4 lectures plus 2 tutorials per week for one semester |
| **Course Assessment:** | Continuous Assessment: 50% (minimum of 3 class tests). Examination: 50% (1 x 3-hour paper). |

**Course description: Limits and continuity of functions:** limit at a point, improper limits, continuity. **Derivatives:** definition, rules of differentiation, chain rule, derivatives of higher order, implicit differentiation, logarithmic differentiation, derivative of the inverse function, derivatives of exponential and logarithmic functions. **Some applications of the exponential functions:** growth and decay. Derivatives of arc functions (inverse trigonometric functions), derivatives of hyperbolic functions, derivatives of area functions (inverse hyperbolic functions). **Applications of the derivative**: extrema of functions, concavity and curve sketching, applications to optimization problems, related rates. Rolle's Theorem, The Mean Value Theorem, L'Hospital's rule. **Integration:** antiderivatives, integration by substitution.

**MAT3641 NUMERICAL METHODS WITH MATLAB**

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|---|---|
| **Course Code:** | **MAT3641** |
| **NQF Level:** | 6 |
| **Notional Hours:** | 80 |
| **NQF Credits:** | 8 |
| **Prerequisite:** | MAT3521 |
| **Contact Hours:** | 2 lectures plus 1 tutorial per week for one semester |
| **Course Assessment:** | Continuous Assessment: **50%** (minimum of 2 class tests). Examination: **50%** (1 x 2-hour paper). |

**Course description: The MATLAB Environment:** arithmetic operations with MATLAB, matrix algebra with MATLAB, MATLAB scripts, matrix operators, graphic output, flow control, MATLAB functions, system of linear equations. **Numerical Methods:** system of non-linear equations, optimization, interpolation, regression, numerical differentiation, quadrature, differential equations. **Application:** dynamical systems, stochastic processes (e.g. throwing dice, tossing coins and dealing cards), discrete processes (e.g. population dynamics), continuous processes (e.g. chemical reactions and kinetics).

**PHY3651: MECHANICS & WAVES**

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|---|---|
| **Course title:** | **MECHANICS & WAVES** |
| **Code:** | **PHY3651** |
| **NQF level:** | 6 |
| **Contact hours:** | 56 Lectures and 14 Practical Sessions/Tutorials |
| **Credits:** | 16 |
| **Course assessment:** | Continuous Assessment (**50%**) and 1 x 3-hour Exam Paper (**50%**)<br>Continuous Assessment will consist of three (3) class tests, at least two (2) assignments and practical report(s) consolidated to one (1) practical mark. |
| **Pre-requisites:** | PHY3511: Physics for Physical Sciences I and MAT3512: Precalculus |
| **Co-requisites:** | None |

**Course description:** Vectors, vector operations and the calculus of vectors. Rectilinear and curvilinear motion; Circular motion; Translational & rotational uniform relative motion; Mass; Linear momentum; Newton's Laws; Friction; The linear and quadratic laws of fluid drag; Variable mass systems; Angular momentum; Central forces; Work energy and power; Conservation laws; Rectilinear motion under conservative forces; Non-conservative forces; Centre of mass; Motion of the centre of mass. Linear and angular momentum of a system; Kinetic energy of a system; Conservation laws of a system; Transforming between Laboratory and Centre-of-mass Frames; Reduced mass; Collision Theory; Rutherford scattering; Angular momentum of a rigid body; Moments and products of inertia; Equation of motion for a rotating body; Kinetic energy of rotation; Body on a spring; Classical SHM; Damped SHM; Forced motion; The different kinds of waves; Standing waves on a string; The one dimensional wave equation; Travelling waves: properties; Plane waves; Scalar & vector waves; Reflection and transmission.

**AER3631 FUNDAMENTALS OF PHYSICAL GEOGRAPHY**

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|---|---|
| **Course title:** | **FUNDAMENTALS OF PHYSICAL GEOGRAPHY** |
| **Code:** | **AER3631** |
| **NQA level:** | 6 |
| **Contact hours:** | 4 lecture periods per week for one semester and one 3-hour practical session per week for one semester. |
| **Credits:** | 16 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x3 hour theory paper |
| **Prerequisites:** | **NONE** |

**Course description:** The earth, basic facts and mappings. The varieties of surface form: how surface form develops, plains, surfaces rougher than plains, the margins of the land. Introduction to climate: air temperature and solar energy, the circulation of the atmosphere, winds and pressure, precipitation. Atmospheric disturbances: air masses and fronts. Classification of climates and their distribution: the tropical humid climates, the dry climates, humid mesothermal climates, humid microthermal, polar, and highland climates. Water and the seas: the waters of the land. Natural vegetation and soils.

**AER3621 THEORY OF FLIGHT I**

| | |
|---|---|
| **Course title:** | **THEORY OF FLIGHT I** |
| **Code:** | **AER3621** |
| **NQA level:** | 6 |
| **Contact hours** | 2 lecture periods per week for one semester and one 3-hour practical session per week for. |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | **NONE** |

**Course description:** Principles of flight: subsonic aerodynamics and transonic aerodynamics. Air navigation: basics of navigation, mass and balance, aircraft performance, flight planning and monitoring. Radio navigation: radio aids, basic radar principles, self-contained and external-referenced navigation systems. Flight instruments: air data instruments, gyroscopic instruments, magnetic compass, power plant and system monitoring instruments. Aviation Meteorology: the atmosphere, wind, thermodynamics, clouds and fog, precipitation, air masses and fronts, pressure systems, climatology, flight hazards and meteorological information.

**SECOND SEMESTER COURSES**

**MAT3612 CALCULUS II**

**MAT3612**
6
160
16
MAT3512
4 lectures plus 2 tutorials per week for one semester
**Course Assessment:** Continuous Assessment: **50%** (minimum of 3 class tests). Examination: **50%** (1 x 3-hour paper)
**Course description: Integration:** Riemann sums and the definite integral, the Fundamental Theorem of Calculus, approximations of the Riemann integral using the trapezoidal rule and Simpson's rule, average value of a function on an interval. **Integration techniques:** integration by parts, reduction formulae, trigonometric substitutions, integration of rational functions. **Applications of the Riemann integral:** area of a region bounded by graphs, volume of a solid of revolution, arc length, surface of revolution. Partial differentiation, chain rule, directional derivatives. Classification of critical points for two-variable functions**. Sequences and series of real numbers:** the limit of a sequence, absolutely convergent series, tests of convergence. **Power series:** radius of convergence, interval of convergence, McLaurin and Taylor series, the Binomial Theorem. Double integration, iterated integrals, use of polar coordinates, application of double integration to finding area and volume. Improper integrals..

**MAT3642 ORDINARY DIFFERENTIAL EQUATIONS**

| | |
|---|---|
| **Course Code:** | **MAT3642** |
| **NQF Level:** | 6 |
| **Notional Hours:** | 80 |
| **NQF Credits:** | 8 |
| **Prerequisite :** | MAT3521 and MAT3512 |
| **Contact Hours:** | 2 lectures plus 1 tutorial per week for one semester |
| **Course Assessment:** | Continuous Assessment: **50%** (minimum of 2 class tests). Examination: **50%** (1 x 2-hour paper). |

**Course description:** First order differential equations, linear differential equations of second order, series solutions of second order linear equations, The Laplace transform, systems of first order linear equations.

**PHY3612: ELECTROMAGNETISM**

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|---|---|
| **Course Title:** | **ELECTROMAGNETISM** |
| **Code:** | **PHY3612** |
| **NQF Level:** | 6 |
| **Credits:** | 16 |
| **Contact Time:** | 56 Lectures and 14 Practical Sessions/Tutorials |
| **Course assessment:** | Continuous Assessment (**50%**) and 1 x 3-hour Exam Paper (**50%**)<br>Continuous Assessment will consist of three (3) class tests, at least two (2) tutorial tests/assignments and practical report(s) consolidated to one (1) practical mark. |
| **Pre-requisites:** | PHY3512: Physics for Physical Sciences II and MAT3512: Precalculus |
| **Co-requisites:** | None |

**Model description:** This course will provide students with information on how the charges at rest and those in motion behave. This course will be calculus-based and students will develop the skill to obtain different equations and solve related problems. The contents of the course are: Electric interaction; Static electric charge and Gauss's Law; Electric potential; Capacitors; Electric current; Ohm's law; Resistance, Joule effect and emf; Magnetic interaction; Lorentz force; Electromagnetic field of a moving charge; Electric flux of a moving charge; Magnetic field and electric current; Magnetostatics; Ampere's law; Time dependent electric field; Maxwell's equations.

**AER3612 THEORY OF FLIGHT II**

| | |
|---|---|
| **Course title:** | **THEORY OF FLIGHT I I** |
| **Code:** | **AER3612** |
| **NQA level:** | 6 |
| **Contact hours:** | 4 lecture periods per week for one semester and one 3-hour practical session per week for one semester. |
| **Credits:** | 16 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x3 hour theory paper |
| **Prerequisites:** | AER3621 |
| Co-requisite: | None |

**Course description:** Airframe and systems, power plants, aircraft Nationality and Registration, airworthiness of aircraft and Namibian legislation, security: ICAO Annex 17, Air Defence Identification Zones, Aircraft Accidents and Incidents, Air Service Operations, navigation charts, flight instruments, radio navigation, basic Radar principles, route navigation, area navigation systems.

**AER3642 FLIGHT PHYSIOLOGY**

| | |
|---|---|
| **Course title:** | **FLIGHT PHYSIOLOGY** |
| **Code:** | **AER3642** |
| **NQA level:** | 6 |
| **Contact hours:** | 2 lecture periods per week for one semester |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | None |
| Co-requisite: | AER3621 |

**Course description:** Atmospheric physics, human physiology, the circulatory system, oxygen and respiration. The Nervous system: ear, hearing and balance, eye and vision. Gas law: hypoxia, illusions and disorientation. Flying and Health: sleep and fatigue. High altitude and speed flight. Drugs, alcohol and human stresses.

**YEAR 3**

**FIRST SEMESTER COURSES**

**PHY3711: ELECTRODYNAMICS**

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|---|---|
| **Course title:** | **ELECTRODYNAMICS** |
| **Code:** | **PHY3711** |
| **NQF Level:** | 7 |
| **Contact hours:** | 56 Lectures and 14 Practical Sessions/Tutorials |
| **Credits:** | 16 NQF credits |
| **Course assessment:** | Continuous Assessment (**50%**) and 1 x 3-hour Exam Paper (**50%**)<br>Continuous Assessment will consist of three (3) class tests, at least two (2) tutorial tests/assignments and practical report(s) consolidated to one (1) practical mark. |
| **Pre-requisites:** | PHY3612: Electromagnetism and MAT3612: Calculus II |
| **Co-requisites:** | None |

**Course description:** The following topics are covered in Electrodynamics: Vector analysis, with emphasis on the 'del' operator , integral calculus, curvilinear coordinate systems; The electrostatic field E and its divergence and curl, Gauss's law; The electric potential, Poisson's equation and Laplace's equation; Work and energy in electrostatics, induced charges on conductors and capacitors; Uniqueness theorems and method of images as special techniques for solving some problems; The electric field of a dipole; Electric field in matter – polarization, linear dielectrics, electric displacement; Magnetostatics field B – Lorentz force law, Biot-Savart law, divergence and curl of B, Ampère's law, magnetic vector potential; Magnetic fields in matter – magnetization and the auxiliary field H; Electrodynamics – Ohm's law, Faraday's law, Maxwell's equations in vacuum and in matter, conservation laws, Poynting's theorem.

| **AER3721** | **HISTORY OF AVIATION** |
|---|---|
| **Course title:** | **HISTORY OF AVIATION** |
| **Code:** | **AER3721** |
| **NQA level:** | 7 |
| **Contact hours:** | 2 lecture periods per week for one semester |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | **NONE** |

**Course description:**Aviation timeline, aviation myths and legends, balloons, ornithopters or early helicopters, aviation pioneers, the Wright Brothers, aviation before and during World War One, aviation during and after World War Two, barnstormers and racers, first flights across the Atlantic, the pathfinders of aviation, the era of the jet aircraft, space exploration, airships, the history of airlines, history of national air forces, flying boats, aviation technology and development.

| AER3751 | AIRPORT PLANNING AND MANAGEMENT |
|---|---|
| **Course title:** | **AIRPORT PLANNING AND MANAGEMENT** |
| **Code:** | **AER3751** |
| **NQA level:** | 7 |
| **Contact hours:** | 4 lecture periods per week for one semester and one 3-hour practical session per week for one semester. |
| **Credits:** | 16 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x3 hour theory paper |
| **Prerequisites:** | **NONE** |

**Course description:** Airport organization and public relations management. The economic, political and social role of airports. Airport privatization, revenues and costs. Airport requirements: master plan, site selection, layout, land use, airfield facilities, terminal area and building design. Airport financial management: financing methods and planning.

| AER3711 | THEORY OF FLIGHT III |
|---|---|
| **Course title:** | **THEORY OF FLIGHT III** |
| **Code:** | **AER3711** |
| **NQA level:** | 7 |
| **Contact hours:** | 4 lecture periods per week for one semester and one 3-hour practical session per week for one semester. |
| **Credits:** | 16 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x3 hour theory paper |
| **Prerequisites:** | AER3612 & AER3621 |

**Course description:** Flight performance and planning: multi-engine gas turbine, take-off, cruise, descent, landing, weight and balance, flight planning and monitoring. Meteorology: the atmosphere, clouds and precipitation, motion of the atmosphere, visibility, ice accretion, air-masses and frontal analysis, synoptic charts and upper level weather charts. Human factors: altitude flying, respiration and blood circulation, human information processing, human behavior, flying and health, threat & error management.

**SECOND SEMESTER COURSES**

**PHY3752 MODERN PHYSICS**

| | |
|---|---|
| **Course title:** | **MODERN PHYSICS** |
| **Code:** | **PHY3752** |
| **NQF Level:** | 7 |
| **Contact hours:** | 56 Lectures and 14 Practical Sessions/Tutorials |
| **Credits:** | 16 |
| **Course assessment:** | Continuous Assessment (**50%**) and 1 x 3-hour Exam Paper (**50%**)<br>Continuous Assessment will consist of three (3) class tests, at least two (2) tutorial tests/assignments and practical report(s) consolidated to one (1) practical mark. |
| **Pre-requisites:** | MAT3612: Calculus II and **either** PHY3651: Mechanics & Waves or PHY3612: Electromagnetism |
| **Co-requisites:** | None |

**Course description:** The Birth of Modern Physics: Classical physics of the 1890s, nature of light, the initial atomic theory of matter, problems in 19th-century physics;Special Theory of Relativity: The need for aether, the Michelson-Morley experiment, Einstein's postulates, Lorentz transformation, time dilation and length contraction, addition of velocities, experimental verifications, the twin paradox, space-time and Minkowski diagrams, doppler effect, relativistic momentum, relativistic energy, electromagnetism and relativity, four vectors;Overview of General Relativity：A brief and qualitative descriptive view of: tenets of: General Relativity, tests of General Relativity, gravitational waves, black holes, and frame dragging;Experimental Basis of Quantum Theory: discovery of the X-ray and the Electron, determination of the electron charge, line spectra, blackbody radiation, photoelectric effect, Compton effect;Structure of the Atom: atomic models of Thomson and Rutherford, Rutherford scattering, the classic atomic model, the Bohr Model of the hydrogen atom, successes and failures of the Bohr model, Mosley's law, Franck-Hertz experiment;Wave Properties of Matter and Quantum Mechanics: X-ray scattering, De Broglie waves, electron scattering, particle-wave duality, Heisenberg uncertainty relation, probability, wave functions, the Schrödinger wave equation, expectation values, infinite square-well potential, finite square-well Potential, barriers and tunneling, quantum numbers, Zeeman effect, Lande g factor, spin-orbit interaction;Lasers: stimulated emission, gain and inversion, rate equations, three- and four-level systems, threshold energy, laser applications.

| **AER3732** | **RESEARCH METHODOLOGY** |
|---|---|
| **Course title:** | **RESEARCH METHODOLOGY** |
| **Code:** | **AER3732** |
| **NQA level:** | 7 |
| **Contact hours:** | 2 lecture periods per week for one semester |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | STS3522 |

**Course description:** Various philosophy of science, research proposals (guidance to write good project proposals). Basic research skills (e.g., library research, literature review, article analysis, etc.,). Research strategy: planning, designing and implementing. Data collection and interpretation methods, data reduction, error analysis (error propagation). Data analysis, report writing, communication, skill required to communicate research findings to a broader audience, presentations, (oral and written). Peer reviewing, refereed Journals, ethics and legal issues (e.g. Plagiarism). Basic quantitative research (concerned with the tabulation or numeric relevance of various kinds of behavior (measuring). Basic of qualitative research.

| **AER3702** | **AVIATION MANAGEMENT PRINCIPLES** |
|---|---|
| **Course title :** | **AVIATION MANAGEMENT PRINCIPLES** |
| **Code:** | **AER3702** |
| **NQA level:** | 7 |
| **Contact hours:** | 2 lecture periods per week for one. |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | None |
| Co-requisite: | ARM3741 |

**Course description:** Air transportation, aviation law, airline management, aviation safety and accident investigation. Principles of macro and micro economics, principles of management, financial and managerial accounting. Human capital, business statistics, public policy and labour laws. Collective bargaining, dispute resolution and labour relations environment.

| **AER3722** | **AVIATION ETHICS** |
|---|---|
| **Course title :** | **AVIATION ETHICS** |
| **Code :** | **AER3722** |
| **NQA level:** | 7 |
| **Contact hours:** | 2 lecture periods per week for one semester |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | None |
| Co-requisite: | ARM3721 |

**Course description:** Ethical theories: dilemmas, decision-making, rights and character. Capitalism and its critics, the business of aviation, issues in responsibility and whistle-blowing in aviation. Racial discrimination against pilots: race, gender and age. Economic favouritism.

| AER3742 | AVIATION LAWS AND REGULATIONS |
|---|---|
| **Course title:** | **AVIATION LAWS AND REGULATIONS** |
| **Code :** | **AER3742** |
| **NQA level:** | 7 |
| **Contact hours:** | 2 lecture periods per week for one semester |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | None |
| Co-requisite: | AER3751 |

**Course description:** Aviation rules: administration, aircraft, personnel, airspace**,** carriage of dangerous goods, aerodrome traffic and noise, aircraft registration and parachuting. Certification: air operators, adventure aviation, large and medium aeroplanes, aeronautical information services organisations, agricultural aircraft operations, aviation training organisations, aircraft maintenance, design, manufacturing and recreation organisations. Aerodromes, aeronautical telecommunication, air traffic and instrument flight procedures. Aviation meteorological service organisations and foreign air transport operators.

| AER3762 | AIRCRAFT TURBINE ENGINE OPERATION |
|---|---|
| **Course title:** | **AIRCRAFT TURBIN ENGINE OPERATION** |
| **Code:** | **AER3762** |
| **NQA level:** | 7 |
| **Contact hours:** | 2 lecture periods per week for one semester and one 3-hour practical session per week for one semester. |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | None |
| Co-requisite: | AER3711 |

**Course description:** The gas turbine cycle. Basic principles, performance and efficiency of gas turbine. Effects of turbine temperature, atmospheric conditions on gas turbine. Engine sections, compressor stall and surge in gas turbine.

**YEAR 4**

**FIRST SEMESTER MODULES**

| **PHY3809: ADVANCED ELECTRODYNAMICS** | |
|---|---|
| **Course title:** | **ADVANCED ELECTRODYNAMICS** |
| **Code:** | **PHY3809** |
| **NQF Level:** | 8 |
| **Contact hours:** | 28 Lectures and 7 Practical Sessions/Tutorials |
| **Credits:** | 8 NQF credits |
| **Course assessment:** | Continuous Assessment (**50%**) and 1 x 2-hour Exam Paper (**50%**)<br>Continuous Assessment will consist of two (2) class tests, at least two (2) assignments and practical report(s) and/or presentation(s) consolidated to one (1) practical mark |
| **Pre-requisites:** | PHY3711: Electrodynamics |
| **Co-requisites:** | None |

**Course description:** This course is a follow-up on the course Electrodynamics and constitute the following topics: Conservation laws in electrodynamics; Vector and scalar potential formulation; Coulomb and Lorentz transformations; Retarded potentials and Jefimenko's equations; Lièнard-Wiechert potentials; Electric and magnetic dipole radiation, power radiated; Linear Antennas; Electrodynamics and relativity – relativistic magnetism, field transformation, field tensor.

| **AER3811** | **AVIATION SAFETY** |
|---|---|
| **Course title:** | **AVIATION SAFETY** |
| **Code:** | **AER3811** |
| **NQA level:** | 8 |
| **Contact hours:** | 4 lecture periods per week for one semester and one 3-hour practical session per week for one semester. |
| **Credits:** | 16 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x3 hour theory paper |
| **Prerequisites:** | AER3702 |

**Course description:** Flight safety: regulatory bodies, flight safety statistics, air traffic control, mechanical and human factors analysis. Accident investigation procedures, managing flight safety, organizational roles, institutional roles and cockpit resource management. Ground safety: aviation ground operations environment, aircraft mishaps, aircraft hazards, ground support equipment and hazardous material. Systems management: human factors concerns, risk management theory, preventative accident methodology and safety reporting systems.

| **AER3831** | **ADVANCED AIRCRAFT PERFORMANCE** |
|---|---|
| **Course title:** | **ADVANCED AIRCRAFT PERFORMANCE** |
| **Code:** | **AER3831** |
| **NQA level:** | 8 |
| **Contact hours:** | 4 lecture periods per week for one semester and one 3-hour practical session per week for one semester. |
| **Credits:** | 16 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x3 hour theory paper |
| **Prerequisites:** | AER3762 |

**Course description:** Weight and balance, aerodynamic, engine and propeller performance of aircrafts. Aeroplane trim, flight envelopes, take-off and field performance. Climb, cruise, descent and landing performance of aircrafts. Manoeuvre, thermo-structural and environmental performance. Mission analysis. Aircraft noise: sources, propagation and flight trajectories.

| **AER3821** | **CREW RESOURCE MANAGEMENT IN AVIATION** |
|---|---|
| **Course title:** | **CREW RESOURCE MANAGEMENT IN AVIATION** |
| **Code:** | **AER3821** |
| **NQA level:** | 8 |
| **Contact hours:** | 2 lecture periods per week for one semester |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | AER3742 |

**Course description: Human err**or **and reliability** in crew resource management in aviation**:** types of error, human factor mishap, and threat. Error management: error chain, prevention and detection, safety culture, standing operation procedures (SOPs) and organizational factors. **Stress:** acute stress responses, workload and fatigue. **Situational awareness:** detection, processing, action, complacency, risk management, situational awareness and automation management. **Decision making:** skill based, rule based and knowledge based decisions. **Effective communications:** inquiry, advocacy and assertiveness. Conflict resolution, feedback and critique. **Leadership, team behavi**or **and synergy.**

**FIRST AND SECOND SEMESTER COURSE**

| **AER3810** | **RESEARCH PROJECT** |
|---|---|
| **Course title:** | **RESEARCH PROJECT** |
| **Code:** | **AER3810** |
| **NQA level:** | 8 |
| **Contact hours:** | 2 consultation periods per week for one semester |
| **Credits:** | 32 |
| **Course assessment:** | Continuous assessment: 100% (Oral presentation of research proposal – 10%; written research proposal – 20%, oral presentation of results – 20%, written research report - 50%) |
| **Prerequisites:** | AER3732 |

**Course description:** Identification of research topic; literature review, data collection, analysis, proposal development, presentation, evaluation and report writing.

**SECOND SEMESTER COURSES**

| **PHY3802: NUCLEAR PHYSICS** | |
|---|---|
| **Course title:** | **NUCLEAR PHYSICS** |
| **Code:** | **PHY3802** |
| **NQF Level:** | 8 |
| **Contact hours:** | 28 Lectures and 7 Practical Sessions/Tutorials |
| **Credits:** | 8 |
| **Course assessment:** | Continuous Assessment (**50%**) and 1 x 2-hour Exam Paper (**50%**)<br>Continuous Assessment will consist of two (2) class tests, at least two (2) assignments and practical report(s) and/or presentation(s) consolidated to one (1) practical mark |
| **Pre-requisites:** | PHY3752: Modern Physics |
| **Co-requisites:** | None |

**Course description::** Nuclear Structure, nuclear radius, nomenclature; Decay of the nucleus, alpha decay, beta decay, gamma decay, spontaneous fission; Radioactivity, radioactive growth and decay, transient equilibrium, secular equilibrium, radioactive decay series, carbon dating; Chart of Nuclides; Nuclear reactions, elastic scattering, inelastic scattering, reaction of transmutation, radiative capture, photodisintegration, induced fission; Interaction of radiation with matter, photoelectric effect, pair production, Compton scattering, calculation of energy transferred in Compton scattering using relativistic equations; The liquid drop model, variation of binding energy per nucleon with mass number; Weizsacher's semi-empirical mass formula; The shell model; Nuclear energy, nuclear reactors, introductory reactor physics, nuclear power plants; Nuclear instrumentation, radiation detectors, accelerators; Two body systems and nuclear force: properties of nuclear forces, the deuteron, qualitative treatment of n-p and p-p scattering at low energies; Elementary particle.

| **AER3812** | **AVIATION NAVIGATION GPS** |
|---|---|
| **Course title :** | **AVIATION NAVIGATION GPS** |
| **Code :** | **AER3812** |
| **NQA level:** | 8 |
| **Contact hours:** | 4 lecture periods per week for one semester and one 3-hour practical session per week for one semester. |
| **Credits:** | 16 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x3 hour theory paper |
| **Prerequisites:** | AER3742 |

**Course description:** Principles and components of the GPS system: architecture and control, aircraft GPS equipment and triangulation. GPS navigation system performance: Technical Standard Order (TSO) and non TSO units, random autonomous integrity monitoring (RAIM), GPS errors and limitations. Integrated VFR flight planning and operations with a GPS: Standard VFR flight planning; Flight route entry into GPS; Standard VFR flight plan cross-checks with GPS; In flight VFR - GPS cross-checks (planned points). VFR-GPS assisted check flight: flight plan, GPS installation, unit modes and operations. GPS data interpretations: CDI bar, track, heading, range, groundspeed and time.

| **AER3822** | **AVIATION LEADERSHIP** |
|---|---|
| **Course title:** | **AVIATION LEADERSHIP** |
| **Code :** | **AER3822** |
| **NQA level:** | 8 |
| **Contact hours:** | 2 lecture periods per week for one semester |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | AER3722 |

**Course description:** History of air transport, airlines' organizational structure and economics, airline management, marketing, scheduling and pricing. Fundamentals of air cargo transportation, basics fleet selection and financing, aviation career planning and development. Leadership: in Army, Air Force and Navy.

| AER3842 | AVIATION-AEROSPACE SECURITY ISSUES |
|---|---|
| **Course title:** | **AVIATION-AEROSPACE SECURITY ISSUES** |
| **Code:** | **AER3842** |
| **NQA level:** | 8 |
| **Contact hours:** | 2 lecture periods per week for one semester |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | AER3722 |

**Course description:** Security techniques: definition of security, concept of security risk, technologies and security measures at airports. ICAO and Namibia DCA regulations: history, application, ICAO standards, treaties and international obligations. Terrorism: terrorist activities and philosophies, hijacking and piracy. Improvised explosive devices: types and effect, searching for IEDs and management of threat. Dangerous goods. Quarantine and customs.

| AER3862 | AVIATION TERRORISM AND ASYMMETRICAL WARFARE |
|---|---|
| **Course title:** | **AVIATION TERRORISM AND ASYMMETRICAL WARFARE** |
| **Code:** | **AER3862** |
| **NQA level:** | 8 |
| **Contact hours:** | 2 lecture periods per week for one semester |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | None |
| Co-requisite: | AER3811 |

**Course description:** Air forces strategies in modern military. Aerial intelligence: threat analysis methodology and air power challenges. **Air force components:** air defence, space and the UAV's.**Operational aspects**. Air force missions and capabilities: internet and air warfare, principles of attack cycle, air force budgeting and aviation terrorism. **Asymmetric warfare and the war against terror:** command and control in asymmetric air warfare, ethics and morals.

## D.5. BACHELOR OF SCIENCE IN MILITARY SCIENCE (NAUTICAL) HONOURS

### *D.5.1. Qualification: BSc Honours Military Science Nautical - Mechanics 21BMSM*

Students opting for a Military Science (Nautical - Mechanics) must take all of the following courses:

**YEAR 1**

| SEMESTER | MODULE NAME | COURSE CODE | CREDITS | PRE-REQUISITES | CO-REQUISITES |
|---|---|---|---|---|---|
| 1 | English Communication & Study Skills | LCE 3419 | 16 | None | None |
| 1 | Basic Mathematics | MAT3511 | 16 | None | None |
| 1 | Computer Literacy | CLC3509 | 8 | None | None |
| 1 | Analytic Geometry | MAT3501 | 8 | None | None |
| 1 | Matrices and Complex Numbers | MAT3521 | 8 | None | None |
| 1 | Physics for Physical Sciences I | PHY3511 | 16 | None | None |
| 1 | Fundamentals of Information Technology I | CIT3521 | 8 | None | None |
| 1&2 | Contemporary Social Issues | CSI3580 | 8 | None | None |
| 2 | English for Academic Purposes | LEA3519 | 16 | None | ULCE3419 |
| 2 | Fundamentals of Information Technology II | CIT3512 | 16 | None | SCIT3521 |
| 2 | Precalculus | MAT3512 | 16 | None | None |
| 2 | Introduction to Statistics | STS3522 | 8 | None | None |
| 2 | Physics for Physical Sciences II | PHY3512 | 16 | None | None |
| **Total Credits** | | | **160** | | |

**YEAR 2**

| SEMESTER | MODULE NAME | COURSE CODE | CREDITS | PRE-REQUISITES | CO-REQUISITES |
|---|---|---|---|---|---|
| 1 | Calculus I | MAT3611 | 16 | MAT3512 | None |
| 1 | Numerical Methods with MATLAB | MAT3641 | 8 | MAT3521 | None |
| 1 | Mechanics and Waves | PHY3651 | 16 | MAT3512 & PHY3511 | None |
| 1 | Propulsion | NAV3661 | 8 | PHY3511 | None |
| 1 | Seamanship | NAV3601 | 8 | None | None |
| 2 | Calculus II | MAT3612 | 16 | MAT3512 | None |
| 2 | Ordinary Differential Equations | MAT3642 | 8 | MAT3521 and MAT3512 | None |
| 2 | Electromagnetism | PHY3612 | 16 | PHY3512 &MAT3512 | None |
| 2 | Ship Stability and Controls | NAV3642 | 8 | None | NAV3601 |
| 2 | Maritime History | NAV3622 | 8 | None | None |
| 2 | Marine Radio Communications | NAV3652 | 16 | CIT3512 | None |
| **Total Credits** | | | **128** | | |

**YEAR 3**

| SEMESTER | MODULE NAME | MODULE CODE | CREDITS | PRE-REQUISITES | CO-REQUISITES |
|---|---|---|---|---|---|
| 1 | Military Psychology | ARM3721 | 16 | None | None |
| 1 | Military Management | ARM3741 | 8 | None | None |
| 1 | Navigation and Naval Operations | NAV3711 | 16 | NAV3601 | None |
| 1 | Applied Thermodynamics | NAV3751 | 16 | PHY3512 | None |
| 1 | Auxiliaries Naval Engines | NAV3731 | 16 | NAV3661 | None |
| 2 | Research Methodology | AER3732 | 8 | STS3522 | None |
| 2 | Modern Physics | PHY3752 | 16 | MAT3612 and either PHY3651 or PHY3612 | None |
| 2 | Advanced Navigation | NAV3742 | 8 | NAV3711 | None |
| 2 | Vector Analysis | MAT3742 | 8 | MAT3612 | None |
| 2 | Naval Weapon Systems | NAV3722 | 8 | None | None |
| 2 | Ship Design | NAV3762 | 8 | NAV3642 | None |
| **Total Credits** | | | **128** | | |

**YEAR 4**

| SEMESTER | MODULE NAME | MODULE CODE | CREDITS | PRE-REQUISITES | CO-REQUISITES |
|---|---|---|---|---|---|
| 1&2 | Research Project | NAV3810 | 32 | AER3732 | None |
| 1 | Astro-Navigation | NAV3801 | 8 | NAV3742 | None |
| 1 | Military Leadership | ARM3831 | 16 | ARM3741 | None |
| 1 | Material Resistance | NAV3841 | 8 | NAV3751 | None |
| 1 | Process and Material Technologies | NAV3821 | 8 | PHY3651 | None |
| 1 | Ship Hydro-Statics and Stability | NAV3871 | 16 | NAV3762 | None |
| 2 | Nuclear Physics | PHY3802 | 8 | PHY3752 | None |
| 2 | Naval Warfare | NAV3822 | 8 | None | None |
| 2 | Engine Automation and Controls | NAV3862 | 8 | NAV3731 | None |
| 2 | Applied Electronics | NAV3882 | 8 | PHY3612 | None |
| 2 | Corrosion and Controls | NAV3802 | 8 | NAV3821 | None |
| **Total Credits** | | | **128** | | |

## D.5.1 BACHELOR OF SCIENCE IN MILITARY SCIENCE (NAUTICAL) HONOURS COURSE DESCRIPTION

**FIRST YEAR COURSES**

**LCE3419 ENGLISH COMMUNICATION & STUDY SKILLS**

**Course title:** **ENGLISH COMMUNICATION AND STUDY SKILLS**
**Code:** **LCE3419**
**NQF Level:** 4
**Contact hours:** 4 hours per week for one semester
**Credits:** 16
**Course Assessment:** Continuous assessment (60%): two tests (reading and writing), two reading assignments, one oral presentation Examination (40%): one 3-hour examination paper
**Pre-requisites:** None
**Course description:** This course is aimed at assisting students in the development of their reading, writing and speaking and listening skills, in order to cope with studying in a new academic environment and in a language which may not be their first language. The course also focuses on study skills that students need throughout their academic careers and beyond. The course serves as an introduction to university level academics, where styles of teaching and learning differ from those at secondary schools in that more responsibility is placed on the student. The course therefore, focuses on the skills that students need throughout their academic careers and beyond.

**MAT3511 BASIC MATHEMATICS**

**Course Code** MAT3511
**NQF Level** 5
**Notional Hours** 160
**NQF Credits** 16
**Prerequisite** None
**Contact Hours** 4 lectures plus **2** tutorials per week for one semester
**Course Assessment:** Continuous Assessment: **50%** (minimum of 3 class tests). Examination: **50%** (1 x 3-hour paper).
**Course description: Algebraic expressions:** Simplification, expansion, factorization, polynomials, remainder and factor theorem, quadratic polynomial. Binomial expansions, Pascal's triangle and the Binomial Theorem.Rational expressions, partial fractions. **Equations and inequalities:** Linear equations in one-variable, simultaneous linear equations, quadratic equations, simultaneous non-linear equations. Linear inequalities, non-linear inequalities. **Sets:** What is a set? Set notation, equality of sets, subsets, characterization of equality via the subset relation, empty set, power sets, Venn diagrams, intersection, union, complement, de Morgan's laws, set difference, symmetric difference, proofs of *simple results* on set equality. Standard examples of sets: natural numbers, integers, rationals, real numbers. Absolute value, intervals in R. A bit about cardinality of sets (examples of finite, *infinite, countable, uncountable sets)*. **Trigonometry:** Trigonometric ratios, angle orientation in the *xy*-plane, graphs of trigonometric functions, trigonometric identities, justifying (proving) equality of relatively simple trigonometric expressions. Sum/difference, double angle, half angle and sum to product formulas. **Sequences:** Definition, notation, obtaining the general term in sequences, arithmetic sequences, geometric sequences, recursively defined sequences.

**CLC3509 COMPUTER LITERACY**

**Course title:** **COMPUTER LITERACY**
**Code:** **CLC3509**
**NQF level:** 4
**Contact hours:** 1 lecture theory and 1 lecture practical per week for one semester
**Credits:** 8
**Course assessment:** Continuous Assessment **100%**: 2 Practical Tests **50%**, 2 Theory Tests **50%**
**Prerequisites:** None
**Course description:** The aim of this course is to equip the students through hands-on experience with the necessary skills to use application software: word processing, spreadsheets, databases, presentations and communications. The objective is to increase student's productivity in both the education and later, the work environment.
**Content:** The course covers the following topics. Introduction to Computers: hardware and software, types and categories of computers, usage of Computer devices and peripherals. Working with the windows operating system: File Management, working with multiple programs, using the recycle bin. Using a word processor: formatting a text and documents, spelling check, grammar and thesaurus tools, inserting tables, auto-shapes, clip arts, charts, and mail merge. Spreadsheet: worksheets and workbooks, ranges, formulas and functions, creating graphs, charts, and printing the workbook. Databases: creating tables, relationships, queries, forms and reports. Presentation software: slide layout and master, animations, auto-content wizard and templates. Communication tools: introduction to the Internet, web browsers, search engines, downloading and uploading files, creating and sending messages, email etiquette, internet security, and digital signatures.

**MAT3501 ANALYTIC GEOMETRY (MAT3520 ANALYTIC GEOMETRY A)**

**Course Code:** **MAT3501**
**NQF Level:** 5
**Notional Hours:** 80
**NQF Credits:** 8
**Prerequisite:** None
**Contact Hours:** 2 lectures plus 1 tutorial per week for one semester
**Course Assessment:** Continuous Assessment: 50% (minimum of 2 class tests). Examination: 50% (1 x 2-hour paper).
**Course description: Introduction:** Lines, circles and tangent lines. **Conic sections:** ellipse, parabola, hyperbola. Translation and rotation of the axes. **Parametric equations:** circle, ellipse, Parabola, Hyperbola, cycloids. **Polar coordinates:** definition, relating polar and Cartesian coordinates, Conic sections in polar coordinates. **Surfaces and quadrics:** Spheres, cylinders, ellipsoids, paraboloids, hyperboloids, cones. Spherical and cylindrical coordinates.

**MAT3521 MATRICES AND COMPLEX NUMBERS (MAT3540 MATRICES AND COMPLEX NUMBERS A)**

**Course Code:** MAT3521
**NQF Level:** 5
**Notional Hours:** 80
**NQF Credits:** 8
**Prerequisite:** None
**Contact Hours:** 2 lectures plus 1 tutorial per week for one semester
**Course Assessment:** Continuous Assessment: 50% (minimum of 2 class tests). Examination: 50% (1 x 2-hour paper).
**Course description: Vectors in 2-and 3-dimensions:** addition of vectors, multiplication by a scalar, norm of a vector, dot product, cross product. Lines and planes in 3D-space. **Systems of linear equations:** introduction to linear systems, solution by Gaussian elimination and Gauss–Jordan elimination (for up to 3 x 3). **Matrices:** addition, multiplication, scalar multiplication, transpose (for up to 3 x 3), elementary matrices, diagonal, triangular and symmetric matrices, determinant and inverse (for up to 3 x 3), solutions of systems of linear equations by Cramer's rule (for up to 3 x 3). **Complex Numbers:** complex planes, operations on complex numbers, modulus, complex conjugate, division, modulus-argument form, de Moivre's formula, Euler's formula, Fundamental Theorem of Algebra.

**PHY3511: PHYSICS FOR PHYSICAL SCIENCES I**

**Course title:** **PHYSICS FOR PHYSICAL SCIENCES I**
**Code:** **PHY3511**
**NQF level:** 5
**Contact hours:** 56 Lectures and 14 Practical Sessions/Tutorials
**Credits:** 16
**Course assessment:** Continuous Assessment (**50%**) and 1 x 3-hour Exam Paper (**50%**)
Continuous Assessment will consist of three (3) class tests, at least two (2) tutorial tests/assignments and practical report(s) consolidated to one (1) practical mark.
**Pre-requisites:** NSSC Physical Science and Mathematics (C-symbols)
**Co-requisites:** None
**Course description:** Units, significant figures & scientific notation; vectors: properties, components, unit vectors, products; average & instantaneous speed, velocity and acceleration; one dimensional motion with constant acceleration; falling bodies; two dimensional motion with constant acceleration; projectile motion; uniform circular motion; circular motion; relative velocity and acceleration; Newton's laws; inertial frames; weight; friction; applications; work and kinetic energy; power; conservative and non-conservative forces; gravitational potential energy; conservation theorem; work-energy theorem; linear momentum & impulse; conservation of linear momentum - 2 particle system; collisions; equilibrium; centre of gravity; applications; Newtonian gravitation; gravitational constant; weight & gravitational force; Kepler's laws; pressure; Archimedes' principle; laminar flow; Bernoulli's equation; temperature & temperature scales; thermal expansion; ideal gas; heat; heat capacity; latent heat; heat transfer.

**CIT3521 FUNDAMENTALS OF INFORMATION TECHNOLOGY I**

**Course Title:** **Fundamentals of Information Technology I**
**Course Code** **CIT3521**
**NQF Level** 5
**Notional Hours** 80
**NQF Credits** 8
**Course Assessment** Continuous Assessment **50%** (Minimum of 2 tests and 2 assignments) Examinations **50%**
**Contact Hours** 2 lecture periods per week and half a practical session per week for one semester
**Prerequisite** None
**Course Descriptions:** This course introduces pervasive Themes in Information Technology and covers the following topics: IT and Its Related Disciplines, Application Domains, History of the Internet; Communications media; Data transmission; Information technology security; Operating systems; Introduction to Web design and Web applications, Web technologies.

**LEA3519 ENGLISH FOR ACADEMIC PURPOSES**

| | |
|---|---|
| **Course title:** | **ENGLISH FOR ACADEMIC PURPOSES** |
| **Code:** | **LEA3519** |
| **NQF level:** | 5 |
| **Contact hours:** | 4 periods per week for one semester |
| **Credits:** | 16 |
| **Course assessment:** | Continuous assessment (**60%**): 2 tests (reading and writing), 1 academic written essay, 1 oral presentation Examination **(40%)**: One three-hour examination paper |
| **Prerequisites:** | None |

**Course description:** This course develops a student's understanding, and competencies regarding academic conventions such as academic reading, writing, listening and oral presentation skills for academic purposes. Students are required to produce a referenced and researched essay written in formal academic style within the context of their university studies. Students are also required to do oral presentations based on their essays. The reading component of the course deals with academic level texts. This involves students in a detailed critical analysis of such texts. The main aim is therefore, to develop academic literacy in English.

**CONTEMPORARY SOCIAL ISSUES CSI3580**

| | |
|---|---|
| **Course title:** | **CONTEMPORARY SOCIAL ISSUES CSI3580** |
| **NQF:** | 5 |
| **Credits:** | 8 |
| **Continuous assessment:** | Continuous Assessment **100%**: Quizzes, Tests, Moodle Assignments, Journal Entries, Reflections, Service and Experiential Learning Projects |
| **Prerequisite:** | None |

**Course Content:** The module is designed to encourage behavioural change among UNAM students and inculcate the primacy of moral reasoning in their social relations and their academic lives. In providing students with critical and analytical thinking the module enables students to grow and develop into well rounded citizens, capable of solving contemporary social challenges experienced in their communities and societies. The teaching of the module takes three dimensions: the intellectual, the professional and the personal dimensions. The intellectual dimension is fostered through engaging students with subject knowledge, independent learning and module assessment. The professional dimension, on the other hand, is fostered through exposing students to real life situations of case studies and practical exercises that draws attention to social issues that attract on-going political, public and media attention and/or debate.

**CIT3512 FUNDAMENTALS OF INFORMATION TECHNOLOGY II**

| | |
|---|---|
| **Course Title:** | **Fundamentals of Information Technology II** |
| **Course Code** | **CIT3512** |
| **NQF Level** | 5 |
| **NQF Credits** | 16 |
| **Contact Hours** | 4 lecture periods per week and onepractical session per week for one semester |
| **Course Assessment** | Continuous Assessment **50%** (Minimum of 2 tests and 2 assignments) Examinations **50%** |
| **Co-Requisites:** | CIT3521Fundamentals of Information Technology I |

**Course Descriptions:** This course is a follow up on Fundamentals of Information Technology I, and covers the following topics: Introduction to Data Communications; Introduction to Wired and wireless LAN technologies; Introduction to Telecommunications Systems; telecommunications standards and protocols; principles behind telecommunications; Networking fundamentals; Telecommunication Fundamentals; Industry standards, topologies and protocols;

**MAT3512 PRECALCULUS**

| | |
|---|---|
| **Course Code** | **MAT3512** |
| **NQF Level** | **5** |
| **Notional Hours** | **160** |
| **NQF Credits** | **16** |
| **Prerequisite** | **None** |
| **Contact Hours** | **4** lectures plus **1 x 2 hour** tutorial per week for one semester |

**Course description: Functions:** one-to-one, onto and bijective functions, horizontal line test, inverse of a function. **Combinations of functions:** composition of functions, sum, difference, quotient of functions and their domains. Polynomial functions, rational functions and their graphs. Introduction of exponential and logarithmic functions. Trigonometric functions and their graphs, inverse trigonometric functions, trigonometric equations. **Limit of a function:** definition, left and right limits, improper limits, continuity in terms of limits. **Differentiation:** rate of change, derivative of a function, rules of differentiation, derivatives of polynomial and rational functions, increasing and decreasing functions and graph sketching. **Integration:** Antiderivatives (polynomial functions and rational exponents), the definite integral, area under a graph.

**STS 3522 INTRODUCTION TO STATISTICS**

| | |
|---|---|
| **NQF Level:** | 5 |
| **Notional Hours:** | 80 |
| **NQF Credits:** | 8 |
| **Course assessment:** | Continuous assessment (at least two test and two assignments) **40%**; Examination **60%** (1x2hour Examination paper). |
| **Pre-requisite:** | Faculty entry requirements |
| **Compulsory/Elective** | Compulsory |
| **Contact hour:** | 2 lectures plus 1-hour tutorial per week/one semester |

**Course Description:** Terminologies used in statistics; Populations and samples as sources of data; The need for sampling; Probability and non-probability sampling techniques; Summarising data using frequency distributions and graphs; Computation of descriptive statistics for ungrouped and grouped data; Use of the scientific calculator.

**PHY3512: PHYSICS FOR PHYSICAL SCIENCES II**

| | |
|---|---|
| **Course Title:** | PHYSICS FOR PHYSICAL SCIENCES II |
| Code: | PHY3512 |
| **NQF Level:** | 5 |
| **Contact Hours:** | 56 Lectures and 14 Practical Sessions/Tutorials |
| **Credits:** | 16 |
| **Course assessment:** | Continuous Assessment (**50%**) and 1 x 3-hour Exam Paper (**50%**)<br>Continuous Assessment will consist of three (3) class tests, at least two (2) tutorial tests/assignments and practical report(s) consolidated to one (1) practical mark. |
| **Pre-requisites:** | None |
| **Co-requisites:** | PHY3511: Physics for Physical Sciences I |

**Course description:** This course introduces the phenomena associated with electrostatics (charges at rest) and magnetostatics (the magnetic effects associated with steady currents). It also introduces and develops the use of the electric and magnetic field vectors and relates them by considering electromagnetic induction at a classical level. The connection between these fields and conventional circuit parameters R, C and L is developed, together with the techniques to deal with elementary transient phenomena. Sound, basic geometrical optics and radioactivity and its detection are also covered. The contents of this course include: Electric charge; insulators and conductors; Electric force and coulomb's law, Electric field and Gauss's law; Electric potential; Capacitance and capacitors; Direct current; Ohm's law and simple circuits; Magnetic field; Alternating current; Transformers; Phenomenological approach to RL and RC circuits; Basic geometrical optics; Radioactivity and its detection; Sound.

**SECOND YEAR COURSES**

**FIRST SEMESTER COURSES**

**MAT3611 CALCULUS I**

**Course Code:** **MAT3611**
**NQF Level:** 6
**Notional Hours:** 160
**NQF Credits:** 16
**Prerequisite:** MAT3512
**Contact Hours:** 4 lectures plus 2 tutorials per week for one semester
**Course Assessment:** Continuous Assessment: 50% (minimum of 3 class tests). Examination: 50% (1 x 3-hour paper).
**Course description: Limits and continuity of functions:** limit at a point, improper limits, continuity. **Derivatives:** definition, rules of differentiation, chain rule, derivatives of higher order, implicit differentiation, logarithmic differentiation, derivative of the inverse function, derivatives of exponential and logarithmic functions. **Some applications of the exponential functions:** growth and decay. Derivatives of arc functions (inverse trigonometric functions), derivatives of hyperbolic functions, derivatives of area functions (inverse hyperbolic functions). **Applications of the derivative**: extrema of functions, concavity and curve sketching, applications to optimization problems, related rates. Rolle's Theorem, The Mean Value Theorem, L'Hospital's rule. **Integration:** antiderivatives, integration by substitution.

**MAT3641 NUMERICAL METHODS WITH MATLAB**

**Course Code:** **MAT3641**
**NQF Level:** 6
**Notional Hours:** 80
**NQF Credits:** 8
**Prerequisite:** MAT3521
**Contact Hours:** 2 lectures plus 1 tutorial per week for one semester
**Course Assessment:** Continuous Assessment: **50%** (minimum of 2 class tests). Examination: **50%** (1 x 2-hour paper).

**Course description: The MATLAB Environment:** arithmetic operations with MATLAB, matrix algebra with MATLAB, MATLAB scripts, matrix operators, graphic output, flow control, MATLAB functions, system of linear equations. **Numerical Methods:** system of non-linear equations, optimization, interpolation, regression, numerical differentiation, quadrature, differential equations. **Application:** dynamical systems, stochastic processes (e.g. throwing dice, tossing coins and dealing cards), discrete processes (e.g. population dynamics), continuous processes (e.g. chemical reactions and kinetics).

**PHY3651: MECHANICS & WAVES**

**Course title:** **MECHANICS & WAVES**
**Code:** **PHY3651**
**NQF level:** 6
**Contact hours:** 56 Lectures and 14 Practical Sessions/Tutorials
**Credits:** 16
**Course assessment:** Continuous Assessment (**50%**) and 1 x 3-hour Exam Paper (**50%**)
Continuous Assessment will consist of three (3) class tests, at least two (2) assignments and practical report(s) consolidated to one (1) practical mark.
**Pre-requisites:** PHY3511: Physics for Physical Sciences I and MAT3512: Precalculus
**Co-requisites:** None
**Course description:** Vectors, vector operations and the calculus of vectors. Rectilinear and curvilinear motion; Circular motion; Translational & rotational uniform relative motion; Mass; Linear momentum; Newton's Laws; Friction; The linear and quadratic laws of fluid drag; Variable mass systems; Angular momentum; Central forces; Work energy and power; Conservation laws; Rectilinear motion under conservative forces; Non-conservative forces; Centre of mass; Motion of the centre of mass. Linear and angular momentum of a system; Kinetic energy of a system; Conservation laws of a system; Transforming between Laboratory and Centre-of-mass Frames; Reduced mass; Collision Theory; Rutherford scattering; Angular momentum of a rigid body; Moments and products of inertia; Equation of motion for a rotating body; Kinetic energy of rotation; Body on a spring; Classical SHM; Damped SHM; Forced motion; The different kinds of waves; Standing waves on a string; The one dimensional wave equation; Travelling waves: properties; Plane waves; Scalar & vector waves; Reflection and transmission.

**NAV3661 PROPULSION**

**Course title:** **PROPULSION**
**Code:** **NAV3661**
**NQA level:** 6
**Contact hours:** 2 lecture periods per week for one semester
**Credits:** 8
**Course assessment:** Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper
**Prerequisites:** PHY3511
**Course description:** Steam propelled Nvala Systems, General Layout of a Steam System, Networks, Accessories and Valves, Heat Exchangers, Fresh Water Generators, Steam Turbines, Operation of a Steam Naval Vessel, Internal Combustion Engines, Gas Turbines and Combined Systems

**NAV3601 SEAMANSHIP**

**Course title:** **SEAMANSHIP**
**Code:** **NAV3601**
**NQA level:** 6
**Contact hours:** 2 lecture periods per week for one semester.
**Credits:** 8
**Course assessment:** Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper
**Prerequisites:** **NONE**
**Course description:** Seamanship skills and ship handling. Roles and Characteristics of warships, international and inland navigational rules and rules of the road. Maritime background, sea laboratories on 42m Patrol vessel (PV), shore-based bridge simulator laboratories and ship maneuvering.

**SECOND SEMESR COURSES**

**MAT3612 CALCULUS II**

**MAT3612**
6
160
16
MAT3512
4 lectures plus 2 tutorials per week for one semester
**Course Assessment:** Continuous Assessment: **50%** (minimum of 3 class tests). Examination: **50%** (1 x 3-hour paper)
**Course description: Integration:** Riemann sums and the definite integral, the Fundamental Theorem of Calculus, approximations of the Riemann integral using the trapezoidal rule and Simpson's rule, average value of a function on an interval. **Integration techniques:** integration by parts, reduction formulae, trigonometric substitutions, integration of rational functions. **Applications of the Riemann integral:** area of a region bounded by graphs, volume of a solid of revolution, arc length, surface of revolution. Partial differentiation, chain rule, directional derivatives. Classification of critical points for two-variable functions**. Sequences and series of real numbers:** the limit of a sequence, absolutely convergent series, tests of convergence. **Power series:** radius of convergence, interval of convergence, McLaurin and Taylor series, the Binomial Theorem. Double integration, iterated integrals, use of polar coordinates, application of double integration to finding area and volume. Improper integrals..

**MAT3642 ORDINARY DIFFERENTIAL EQUATIONS**

**Course Code:** **MAT3642**
**NQF Level:** 6
**Notional Hours:** 80
**NQF Credits:** 8
**Prerequisite :** MAT3521 and MAT3512
**Contact Hours:** 2 lectures plus 1 tutorial per week for one semester
**Course Assessment:** Continuous Assessment: **50%** (minimum of 2 class tests). Examination: **50%** (1 x 2-hour paper).
**Course description:** First order differential equations, linear differential equations of second order, series solutions of second order linear equations, The Laplace transform, systems of first order linear equations.

**PHY3612: ELECTROMAGNETISM**

**Course Title:** **ELECTROMAGNETISM**
**Code:** **PHY3612**
**NQF Level:** 6
**Credits:** 16
**Contact Time:** 56 Lectures and 14 Practical Sessions/Tutorials
**Course assessment:** Continuous Assessment (**50%**) and 1 x 3-hour Exam Paper (**50%**)
Continuous Assessment will consist of three (3) class tests, at least two (2) tutorial tests/assignments and practical report(s) consolidated to one (1) practical mark.
**Pre-requisites:** PHY3512: Physics for Physical Sciences II and MAT3512: Precalculus
**Co-requisites:** None
**Model description:** This course will provide students with information on how the charges at rest and those in motion behave. This course will be calculus-based and students will develop the skill to obtain different equations and solve related problems. The contents of the course are: Electric interaction; Static electric charge and Gauss's Law; Electric potential; Capacitors; Electric current; Ohm's law; Resistance, Joule effect and emf; Magnetic interaction; Lorentz force; Electromagnetic field of a moving charge; Electric flux of a moving charge; Magnetic field and electric current; Magnetostatics; Ampere's law; Time dependent electric field; Maxwell's equations.

**NAV3642 SHIP STABILITY AND CONTROLS**

| | |
|---|---|
| **Course title:** | **SHIP STABILITY AND CONTROLS** |
| **Code:** | **NAV3642** |
| **NQA level:** | 6 |
| **Contact hours:** | 2 lecture periods per week for one semester. |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | Co-requisite: NAV3601 |

**Course description:** Drydocking: metacentric height, MM' and GG' methods. Critical period, GM at critical instant. Intact condition: IMO standard, simplified data, curves of Righting Levers. Inclining Experiment: theory and practice, density and hydrostatic information. Stability characteristics and problems. Vessel rolling and damage stability. Longitudinal stress: buoyancy, shear, load, and bending moment curves. Manoeuvrability: frictional resistance, shallow water, ship to ship and ship to shore interactions. Angle of heel and draft when turning at speed.

**NAV3622 MARITIME HISTORY**

| | |
|---|---|
| **Course title:** | **MARITIME HISTORY** |
| **Code:** | **NAV3622** |
| **NQA level:** | 6 |
| **Contact hours:** | 2 lecture periods per week for one semester. |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | NONE |

**Course description:** Historiography, Ancient times, **Age of Navigation**, Ships and vessels, Arab age of discovery, Hanseatic League, Somali maritime enterprise, **Age of Discovery**, European expansion, European colonization, Clipper route, End of exploration, **Age of Sail**, Notable individuals, Spanish and English Armadas, North American maritime, War of 1812, *Challenger* expedition, End of the sail, **Submarines, Age of Steam,** Rise of the steam vessels, Greek War of Independence, 1850 to the End of the Century, **20th century**, Maritime events of World War I, Maritime events of World War II, Battle of the Atlantic, Pacific War, Latter half of the 20th century, Cuban Missile Crisis, Gulf of Tonkin Incident, Falklands War, Panama canal handover, Namibian Navel History, **21st century**, Piracy

| **NAV3652** | **MARINE RADIO COMMUNICATIONS** |
|---|---|
| **Course title:** | **MARINE RADIO COMMUNICATIONS** |
| **Code:** | **NAV3652** |
| **NQA level:** | 6 |
| **Contact hours:** | 4 lecture periods per week for one semester and one 3-hour practical session per week for one semester. |
| **Credits:** | 16 |
| **Course assessment:** | Continuous assessment **50%** (at least 3 class tests**,** 2 practical reports and assignments) Written Examination **50%**: 1x3 hour theory paper |
| **Prerequisites:** | CIT3512 |

**Course description:** Radio propagation, Marine Communications, Coast Radio and Limited Coast Stations, Power Supplies, Marine Radion Communications Equipment, Digital Selective Calling, Emergency Position Indicating Radio Beacons, Search and Rescue Transponders, Distress Urgency and Safety Communication using radiotelephony, Operating Procedures for routine communications, Maritime communication satellite systems and equipment, GMDSS.

**YEAR 3**

**FIRST SEMESTER COURSES**

**MILITARY SCIENCE ARMY**

| **ARM3721** | **MILITARY PSYCHOLOGY** |
|---|---|
| **Course title:** | **MILITARY PSYCHOLOGY** |
| **Code:** | **ARM3721** |
| **NQA level:** | 7 |
| **Contact hours:** | 2 lecture periods per week for one semester |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | **NONE** |

**Course description:** Personality theory and war: role of personality and personality theory of Jung, adjustment psychology: maladjustment and adolescent, transition in military training. Operational psychology: psychological effects of combat, post-traumatic stress disorder. Peacekeeping psychology: model to support soldiers and their dependants, stressors and prisoner of war. Psychological warfare: ethics in war operations.

| **ARM3741** | **MILITARY MANAGEMENT** |
|---|---|
| **Course title:** | **MILITARY MANAGEMENT** |
| **Code:** | **ARM3741** |
| **NQA level:** | 7 |
| **Contact hours:** | 2 lecture periods per week for one semester |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | **NONE** |

**Course description:** Management: general, environment and diversity. Planning: skills, creative problem solving, strategy and operational processes and organising skills. Organising and delegation; management of change; Leadership skills; group and team development, power, conflict and stress, control of human resources and finance controls in organization.

| **NAV3711** | **NAVIGATION AND NAVAL OPERATIONS** |
|---|---|
| **Course title:** | **NAVIGATION AND NAVAL OPERATIONS** |
| **Code:** | **NAV3711** |
| **NQA level:** | 7 |
| **Contact hours:** | 4 lecture periods per week for one semester. |
| **Credits:** | 16 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x3 hour theory paper |
| **Prerequisites:** | NAV3601 |

**Course description:** Piloting, ship handling skills, basic navigation and rules of the nautical road. Visual and electronic navigation aids, magnetic and gyro compasses and global positioning system satellites. Fundamentals: standing and underway replenishment. Command and control, navigation and naval operation accidents. Voyage planning, contact tracking on maneuvering boards. Charts: navigation and concepts of coordinates. Distances: measurements, calculations, speeds, times and directions.

| NAV3751 | APPLIED THERMODYNAMICS |
|---|---|
| **Course title:** | **APPLIED THERMODYNAMICS** |
| **Code:** | **NAV3751** |
| **NQA level:** | 7 |
| **Contact hours:** | 4 lecture periods per week for one semester and one 3-hour practical session per week for one semester. |
| **Credits:** | 16 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x3 hour theory paper |
| **Prerequisites:** | NAV3661 & NAV3642 |

**Course description:**1st and 2nd Law of thermodynamics, irreversibility and availability, vapor and combined power cycles, gas power cycles, thermodynamic property relations, Gas-vapor mixtures and air conditioning, chemical reactions and phase equilibrium, flow through nozzles and diffusers.

| NAV3731 | AUXILIARIES NAVAL ENGINES |
|---|---|
| **Course title :** | **AUXILIARIES NAVAL ENGINES** |
| **Code :** | **NAV3731** |
| **NQA level:** | 7 |
| **Contact hours:** | 4 lecture periods per week for one semester and one 3-hour practical session per week for one semester. |
| **Credits:** | 16 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x3 hour theory paper |
| **Prerequisites:** | NAV3661 |

**Course description:** Refrigeration and air conditioning techniques. Governing systems, electric power generation on shipboard, components and characteristics of marine auxiliary machines. Heat Exchangers, air compressors, oil water separators and piping systems, ventilation and air conditioning. Lifesaving and firefighting systems, deck machinery and cargo handling equipment.

**SECOND SEMESTER COURSES**

| AER3732 | RESEARCH METHODOLOGY |
|---|---|
| **Course title:** | **RESEARCH METHODOLOGY** |
| **Code:** | **AER3732** |
| **NQA level:** | 7 |
| **Contact hours:** | 2 lecture periods per week for one semester |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | STS3522 |

**Course description:** Various philosophy of science, research proposals (guidance to write good project proposals). Basic research skills (e.g., library research, literature review, article analysis, etc.,). Research strategy: planning, designing and implementing. Data collection and interpretation methods, data reduction, error analysis (error propagation). Data analysis, report writing, communication, skill required to communicate research findings to a broader audience, presentations, (oral and written). Peer reviewing, refereed Journals, ethics and legal issues (e.g. Plagiarism). Basic quantitative research (concerned with the tabulation or numeric relevance of various kinds of behavior (measuring). Basic of qualitative research.

| PHY3752 MODERN PHYSICS | |
|---|---|
| **Course title:** | **MODERN PHYSICS** |
| **Code:** | **PHY3752** |
| **NQF Level:** | 7 |
| **Contact hours:** | 56 Lectures and 14 Practical Sessions/Tutorials |
| **Credits:** | 16 |
| **Course assessment:** | Continuous Assessment (**50%**) and 1 x 3-hour Exam Paper (**50%**)<br>Continuous Assessment will consist of three (3) class tests, at least two (2) tutorial tests/assignments and practical report(s) consolidated to one (1) practical mark. |
| **Pre-requisites:** | MAT3612: Calculus II and **either** PHY3651: Mechanics & Waves or PHY3612: Electromagnetism |
| **Co-requisites:** | None |

**Course description:** The Birth of Modern Physics: Classical physics of the 1890s, nature of light, the initial atomic theory of matter, problems in 19th-century physics;Special Theory of Relativity: The need for aether, the Michelson-Morley experiment, Einstein's postulates, Lorentz transformation, time dilation and length contraction, addition of velocities, experimental verifications, the twin paradox, space-time and Minkowski diagrams, doppler effect, relativistic momentum, relativistic energy, electromagnetism and relativity, four vectors;Overview of General Relativity：A brief and qualitative descriptive view of: tenets of: General Relativity, tests of General Relativity, gravitational waves, black holes, and frame dragging;Experimental Basis of Quantum Theory: discovery of the X-ray and the Electron, determination of the electron charge, line spectra, blackbody radiation, photoelectric effect, Compton effect;Structure of the Atom: atomic models of Thomson and Rutherford, Rutherford scattering, the classic atomic model, the Bohr Model of the hydrogen atom, successes and failures of the Bohr model, Mosley's law, Franck-Hertz experiment;Wave Properties of Matter and Quantum Mechanics: X-ray scattering, De Broglie waves, electron scattering, particle-wave duality, Heisenberg uncertainty relation, probability, wave functions, the Schrödinger wave equation, expectation values, infinite square-well potential, finite square-well Potential, barriers and tunneling, quantum numbers, Zeeman effect, Lande g factor, spin-orbit interaction;Lasers: stimulated emission, gain and inversion, rate equations, three- and four-level systems, threshold energy, laser applications.

| NAV3742 | ADVANCED NAVIGATION |
|---|---|
| **Course title:** | **ADVANCED NAVIGATION** |
| **Code:** | **NAV3742** |
| **NQA level:** | 7 |
| **Contact hours:** | 2 lecture periods per week for one semester. |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | NAV3711 |

**Course description:** Vessel bridge resource management, vessels' shore stations, formal safety assessment (FSA) of vessels, traffic separation schemes and marine accidents.

| NAV3762 | SHIP DESIGN |
|---|---|
| **Course title:** | **SHIP DESIGN** |
| **Code:** | **NAV3762** |
| **NQA level:** | 7 |
| **Contact hours:** | 2 lecture periods per week for one semester and one 3-hour practical session per week for one semester. |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | NAV3642 |

**Course description:** Ship dimension, safety, controls and production steps. Constructional arrangements: general cargo, bulk carriers, combination carriers, container, ro/ro, passenger and war ships. General arrangement: holds, engine-room, peak tanks, double-bottom tanks, hatchways, bulk heats, cargo tanks, deck plating, frames, brackets, transverse frames, deck beams, shell plating, tank tops, stringers, stiffeners bow and stern, fore castle, aft castle, deck hauses, bilges, top-side tanks, hatchcovers, fairleads, mooring bitts, pipes arrangement, fore and aft perpendicular, propeller, shaft, freeboard and draught marks.

**YEAR 4**

**FIRST AND SECOND SEMESTER COURSE**

| **NAV3810** | **RESEARCH PROJECT** |
|---|---|
| **Course title:** | **RESEARCH PROJECT** |
| **Code:** | **NAV3810** |
| **NQA level:** | 8 |
| **Contact hours:** | 2 consultation periods per week for one semester |
| **Credits:** | 32 |
| **Course assessment:** | Continuous assessment: 100% (Oral presentation of research proposal – 10%; written research proposal – 20%, oral p resentation of results – 20%, written research report - 50%). |
| **Prerequisites:** | AER3732 |
| **Course description:** | Identification of research topic; literature review, data collection, analysis, proposal development, presentation, evaluation and report writing. |

**FIRST SEMESTER COURSES**

| **ARM3831** | **MILITARY LEADERSHIP** |
|---|---|
| **Course title:** | **MILITARY LEADERSHIP** |
| **Code:** | **ARM3831** |
| **NQA level:** | 8 |
| **Contact hours:** | 4 lecture periods per week for one semester |
| **Credits:** | 16 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x3 hour theory paper |
| **Prerequisites:** | ARM3741 |
| **Course description:** | Leadership ethics, types and style of leadership, roles and ethics of commander, obedience and order, application of military ethics, code of conduct of the NDF and the Constitution of Namibia. |

| **NAV3801** | **ASTRO-NAVIGATION** |
|---|---|
| **Course title:** | **ASTRO-NAVIGATION** |
| **Code:** | **NAV3801** |
| **NQA level:** | 8 |
| **Contact hours:** | 2 lecture periods per week for one semester and one 3-hour practical session per week for one semester. |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | AER3742 |
| **Course description:** | Celestial Navigation theory, cartography and astronomy, Bowditch, Sextant, index error, star-finder, navigationalstars and planets, electronic navigation, celestial measurements**,** the Nautical Almanac, sight reduction tables, Pilot and Great Circle charts. |

| **NAV3841** | **MATERIAL RESISTANCE** |
|---|---|
| **Course title:** | **MATERIAL RESISTANCE** |
| **Code:** | **NAV3841** |
| **NQA level:** | 8 |
| **Contact hours:** | 2 lecture periods per week for one semester and one 3-hour practical session per week for one semester. |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | NAV3751 |
| **Course description** | **:** Material micro and macro deformation, impulsive and impact loads, damage, beams and plates. Waves in rods: elastic and plastic stress, longitudinal, torsional and flexure waves and shock. Continuum modelling of structures. Numerical analyses of impact problems: explicit time integration, penalty and constraint contact methods, under-integrated element formulations, hourglass control, finite element models. Patterns of Energy absorption rate. |

| **NAV3821** | **PROCESS AND MATERIAL TECHNOLOGIES** |
|---|---|
| **Course title:** | **PROCESS AND MATERIAL TECHNOLOGIES** |
| **Code:** | **NAV3821** |
| **NQA level:** | 8 |
| **Contact hours:** | 2 lecture periods per week for one semester and one 3-hour practical session per week for one semester. |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | PHY3651 |
| **Course description:** | Mechanical properties, measurement techniques, physical properties of materials Miller indices of crystal planes, atomic bonding in crystals and heat treatment of metals and alloys |

| NAV3871 | SHIP HYDRO-STATICS AND STABILITY |
|---|---|
| **Course title:** | **SHIP HYDRO-STATICS AND STABILITY** |
| **Code:** | **NAV3871** |
| **NQA level:** | 8 |
| **Contact hours:** | 4 lecture periods per week for one semester and one 3-hour practical session per week for one semester. |
| **Credits:** | 16 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x3 hour theory paper |
| **Prerequisites:** | NAV3762 |
| **Course description:** | Ship dimensions, coefficients of form, forces and moments, laws of flotation, transverse stability, righting lever GZ, center of gravity, meta-centric heights, stiff and tender ships, statical stability diagram, stability cross curves, inclining experiment, grain cargo and its heeling moments, Bonjean curves, longitudinal stability, trim, trim calculations. |

**SECOND SEMESTER COURSES**

| PHY3802: NUCLEAR PHYSICS | |
|---|---|
| **Course title:** | **NUCLEAR PHYSICS** |
| **Code:** | **PHY3802** |
| **NQF Level:** | 8 |
| **Contact hours:** | 28 Lectures and 7 Practical Sessions/Tutorials |
| **Credits:** | 8 |
| **Course assessment:** | Continuous Assessment (**50%**) and 1 x 2-hour Exam Paper (**50%**)<br>Continuous Assessment will consist of two (2) class tests, at least two (2) assignments and practical report(s) and/or presentation(s) consolidated to one (1) practical mark |
| **Pre-requisites:** | PHY3752: Modern Physics |
| **Co-requisites:** | None |

**Course description:** Nuclear Structure, nuclear radius, nomenclature; Decay of the nucleus, alpha decay, beta decay, gamma decay, spontaneous fission; Radioactivity, radioactive growth and decay, transient equilibrium, secular equilibrium, radioactive decay series, carbon dating; Chart of Nuclides; Nuclear reactions, elastic scattering, inelastic scattering, reaction of transmutation, radiative capture, photodisintegration, induced fission; Interaction of radiation with matter, photoelectric effect, pair production, Compton scattering, calculation of energy transferred in Compton scattering using relativistic equations; The liquid drop model, variation of binding energy per nucleon with mass number; Weizsacher's semi-empirical mass formula; The shell model; Nuclear energy, nuclear reactors, introductory reactor physics, nuclear power plants; Nuclear instrumentation, radiation detectors, accelerators; Two body systems and nuclear force: properties of nuclear forces, the deuteron, qualitative treatment of n-p and p-p scattering at low energies; Elementary particle.

| NAV3822 | NAVAL WARFARE |
|---|---|
| **Course title:** | **NAVAL WARFARE** |
| **Code:** | **NAV3822** |
| **NQA level:** | 8 |
| **Contact hours:** | 2 lecture periods per week for one semester and one 3-hour practical session per week for one semester. |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | None |

**Course description:** Review of military history, age of Galley Warfare, age of sail, war evolution, age of the battleship. Naval Warfare up to World War II. Propulsion and technological advances: weapon systems, nuclear power and missiles. Art and science of naval warfare, doctrine and amphibious operations.

| NAV3862 | ENGINE AUTOMATION AND CONTROLS |
|---|---|
| **Course title:** | **ENGINE AUTOMATION AND CONTROLS** |
| **Code:** | **NAV3862** |
| **NQA level:** | 8 |
| **Contact hours:** | 2 lecture periods per week for one semester and one 3-hour practical session per week for one semester. |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | NAV3731 |

**Course description:** Automation and control: feed-forward, feed-back strategies, dynamics, stability and loop. Dynamical systems and mathematical modelling. Distribution and lump parameter systems. Digital simulation, linearization of nonlinear mathematical model.Nyquist criterion. Controllers: linear PID, discrete-points and control, prime mover and parallel operation. Physical (pneumatic) and algorithmic (software).

| NAV3882 | APPLIED ELECTRONICS |
|---|---|
| **Course title:** | **APPLIED ELECTRONICS** |
| **Code:** | **NAV3882** |
| **NQA level:** | 8 |
| **Contact hours:** | 2 lecture periods per week for one semester and one 3-hour practical session per week for one semester. |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | PHY3612 |

**Course description:** Amplification, resistance and bandwidth. Amplifiers: ideal, practical operation, Bode diagrams, differential, BJT, power, negative feedback and stability. Semiconductor: components, diode, transistors and BJT switches. Computer simulation, power supplies and regulators.

| NAV3802 | CORROSION AND CONTROLS |
|---|---|
| **Course title:** | **CORROSION AND CONTROLS** |
| **Code:** | **NAV3802** |
| **NQA level:** | 8 |
| **Contact hours:** | 2 lecture periods per week for one semester and one 3-hour practical session per week for one semester. |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | NAV3821 |

**Course description:** General corrosion and thermodynamics of corrosion. Cells, electrochemical series, galvanic, Nernst equation, pourbaix diagram and cathodic reactions. Corrosion kinetics: polarisation diagrams, practical measurements and passivity. Corrosion Mechanisms: Effects of oxygen and carbon dioxide, Galvanic corrosion, pitting and crevice corrosion, mechanical interactions, microbial corrosion, Corrosion of welds, Stress corrosion cracking, Hydrogen embrittlement and effects of $H_2S$, high temperature corrosion. Corrosion controls: Paints, cathodic protection, Corrosion resistant alloys, corrosion monitoring, control by design.

### *D.5.2. Qualification: BSc Honours Military Science Nautical - Electronics 21BMSE*

**NOTE; No new students will be registered into this programme for 2022**

Students opting for a Military Science (Nautical - Electronics) must take all of the following courses:

**YEAR 1**

| SEMESTER | MODULE NAME | COURSE CODE | CREDITS | PRE-REQUISITES | CO-REQUISITES |
|---|---|---|---|---|---|
| 1 | English Communication & Study Skills | LCE 3419 | 16 | None | None |
| 1 | Basic Mathematics | MAT3511 | 16 | None | None |
| 1 | Computer Literacy | CLC3509 | 8 | None | None |
| 1 | Analytic Geometry | MAT3501 | 8 | None | None |
| 1 | Matrices and Complex Numbers | MAT3521 | 8 | None | None |
| 1 | Physics for Physical Sciences I | PHY3511 | 16 | None | None |
| 1 | Fundamentals of Information Technology I | CIT3521 | 8 | None | None |
| 1&2 | Contemporary Social Issues | CSI3580 | 8 | None | None |
| 2 | English for Academic Purposes | LEA3519 | 16 | None | LCE3419 |
| 2 | Fundamentals of Information Technology II | CIT3512 | 16 | None | CIT3521 |
| 2 | Precalculus | MAT3512 | 16 | None | None |
| 2 | Introduction to Statistics | STS3522 | 8 | None | None |
| 2 | Physics for Physical Sciences II | PHY3512 | 16 | None | None |
| **Total Credits** | | | **160** | | |

**YEAR 2**

| SEMESTER | MODULE NAME | COURSE CODE | CREDITS | PRE-REQUISITES | CO-REQUISITES |
|---|---|---|---|---|---|
| 1 | Calculus I | MAT3611 | 16 | MAT3512 | None |
| 1 | Numerical Methods with MATLAB | MAT3641 | 8 | MAT3521 | None |
| 1 | Mechanics and Waves | PHY3651 | 16 | MAT3512 & PHY3511 | None |
| 1 | Propulsion | NAV3661 | 8 | PHY3511 | None |
| 1 | Seamanship | NAV3601 | 8 | None | None |
| 2 | Calculus II | MAT3612 | 16 | MAT3512 | None |
| 2 | Ordinary Differential Equations | MAT3642 | 8 | MAT3521 | None |
| 2 | Electromagnetism | PHY3612 | 16 | PHY3512 & MAT3512 | None |
| 2 | Ship Stability and Controls | NAV3642 | 8 | None | NAV3601 |
| 2 | Maritime History | NAV3622 | 8 | None | None |
| 2 | Marine Radio Communications | NAV3652 | 16 | CIT3512 | None |
| **Total Credits** | | | **128** | | |

**YEAR 3**

| SEMESTER | MODULE NAME | CODE | CREDITS | PRE-REQUISITES | CO-REQUISITES |
|---|---|---|---|---|---|
| 1 | Military Psychology | ARM3721 | 16 | None | None |
| 1 | Military Management | ARM3741 | 8 | None | None |
| 1 | Navigation and Naval Operations | NAV3711 | 16 | NAV3601 | None |
| 1 | Electronics I | NAV3741 | 8 | PHY3612 | None |
| 1 | Electro-Techniques | NAV3761 | 16 | PHY3612 | None |
| 1 | Electrodynamics | PHY3711 | 16 | PHY3612 & MAT3612 | None |
| 2 | Research Methodology | AER3732 | 8 | STS3522 | None |
| 2 | Modern Physics | PHY3752 | 16 | MAT3612 and either PHY3651 or PHY3612 | None |
| 2 | Advanced Navigation | NAV3742 | 8 | NAV3711 | None |
| 2 | Vector Analysis | MAT3742 | 8 | MAT3612 | None |
| 2 | Electronics II | NAV3752 | 16 | NAV3741 | None |
| **Total Credits** | | | **128** | | |

**YEAR 4**

| SEMESTER | MODULE NAME | CODE | CREDITS | PRE-REQUISITES | CO-REQUISITES |
|---|---|---|---|---|---|
| 1&2 | Research Project | NAV3810 | 32 | AER3732 | None |
| 1 | Astro-Navigation | NAV3801 | 8 | NAV3742 | None |
| 1 | Military Leadership | ARM3831 | 16 | ARM3741 | None |
| 1 | Advanced Electrodynamics | PHY3809 | 8 | PHY3711 | None |
| 1 | Digital Electronics | NAV3861 | 8 | NAV3752 | None |
| 1 | Digital Techniques | NAV3881 | 8 | NAV3741<br>NAV3752 | None |
| 1 | Signals and Systems | NAV3809 | 8 | NAV3741<br>NAV3752 | None |
| 2 | Nuclear Physics | PHY3802 | 8 | PHY3752 | None |
| 2 | Naval Warfare | NAV3822 | 8 | None | None |
| 2 | Electric-Machines and Drives | NAV3812 | 16 | NAV3752 | None |
| 2 | Theory and Applications of Lasers | NAV3842 | 8 | PHY3612 | None |
| **Total Credits** | | | **128** | | |

*D.5.2.1 Qualification: BSc Honours Military Science Nautical - Electronics 21BMSE COURSE DESCRIPTION*

**FIRST YEAR COURSES**

**FIRST SEMESTER COURSES**

**LCE3419 ENGLISH COMMUNICATION & STUDY SKILLS**

| | |
|---|---|
| **Course title:** | **ENGLISH COMMUNICATION AND STUDY SKILLS** |
| **Code:** | **LCE3419** |
| **NQF Level:** | 4 |
| **Contact hours:** | 4 hours per week for one semester |
| **Credits:** | 16 |
| **Course Assessment:** | Continuous assessment (60%): two tests (reading and writing), two reading assignments, one oral presentation Examination (40%): one 3-hour examination paper |
| **Pre-requisites:** | None |

**Course description:** This course is aimed at assisting students in the development of their reading, writing and speaking and listening skills, in order to cope with studying in a new academic environment and in a language which may not be their first language. The course also focuses on study skills that students need throughout their academic careers and beyond. The course serves as an introduction to university level academics, where styles of teaching and learning differ from those at secondary schools in that more responsibility is placed on the student. The course therefore, focuses on the skills that students need throughout their academic careers and beyond.

**MAT3511 BASIC MATHEMATICS**

| | |
|---|---|
| **Course Code** | MAT3511 |
| **NQF Level** | 5 |
| **Notional Hours** | 160 |
| **NQF Credits** | 16 |
| **Prerequisite** | None |
| **Contact Hours** | 4 lectures plus **2** tutorials per week for one semester |

**Course Assessment:** Continuous Assessment: **50%** (minimum of 3 class tests). Examination: **50%** (1 x 3-hour paper).

**Course description: Algebraic expressions:** Simplification, expansion, factorization, polynomials, remainder and factor theorem, quadratic polynomial. Binomial expansions, Pascal's triangle and the Binomial Theorem.Rational expressions, partial fractions. **Equations and inequalities:** Linear equations in one-variable, simultaneous linear equations, quadratic equations, simultaneous non-linear equations. Linear inequalities, non-linear inequalities. **Sets:** What is a set? Set notation, equality of sets, subsets, characterization of equality via the subset relation, empty set, power sets, Venn diagrams, intersection, union, complement, de Morgan's laws, set difference, symmetric difference, proofs of *simple results* on set equality. Standard examples of sets: natural numbers, integers, rationals, real numbers. Absolute value, intervals in R. A bit about cardinality of sets (examples of finite, *infinite, countable, uncountable sets)*. **Trigonometry:** Trigonometric ratios, angle orientation in the *xy*-plane, graphs of trigonometric functions, trigonometric identities, justifying (proving) equality of relatively simple trigonometric expressions. Sum/difference, double angle, half angle and sum to product formulas. **Sequences:** Definition, notation, obtaining the general term in sequences, arithmetic sequences, geometric sequences, recursively defined sequences.

**CLC3509 COMPUTER LITERACY**

| | |
|---|---|
| **Course title:** | **COMPUTER LITERACY** |
| **Code:** | **CLC3509** |
| **NQF level:** | 4 |
| **Contact hours:** | 1 lecture theory and 1 lecture practical per week for one semester |
| **Credits:** | 8 |
| **Course assessment:** | Continuous Assessment **100%**: 2 Practical Tests **50%**, 2 Theory Tests **50%** |
| **Prerequisites:** | None |

**Course description:** The aim of this course is to equip the students through hands-on experience with the necessary skills to use application software: word processing, spreadsheets, databases, presentations and communications. The objective is to increase student's productivity in both the education and later, the work environment.

**Content:** The course covers the following topics. Introduction to Computers: hardware and software, types and categories of computers, usage of Computer devices and peripherals. Working with the windows operating system: File Management, working with multiple programs, using the recycle bin. Using a word processor: formatting a text and documents, spelling check, grammar and thesaurus tools, inserting tables, auto-shapes, clip arts, charts, and mail merge. Spreadsheet: worksheets and workbooks, ranges, formulas and functions, creating graphs, charts, and printing the workbook. Databases: creating tables, relationships, queries, forms and reports. Presentation software: slide layout and master, animations, auto-content wizard and templates. Communication tools: introduction to the Internet, web browsers, search engines, downloading and uploading files, creating and sending messages, email etiquette, internet security, and digital signatures.

**MAT3501 ANALYTIC GEOMETRY (MAT3520 ANALYTIC GEOMETRY A)**

**Course Code:** **MAT3501**
**NQF Level:** 5
**Notional Hours:** 80
**NQF Credits:** 8
**Prerequisite:** None
**Contact Hours:** 2 lectures plus 1 tutorial per week for one semester
**Course Assessment:** Continuous Assessment: 50% (minimum of 2 class tests). Examination: 50% (1 x 2-hour paper).
**Course description: Introduction:** Lines, circles and tangent lines. **Conic sections:** ellipse, parabola, hyperbola. Translation and rotation of the axes. **Parametric equations:** circle, ellipse, Parabola, Hyperbola, cycloids. **Polar coordinates:** definition, relating polar and Cartesian coordinates, Conic sections in polar coordinates. **Surfaces and quadrics:** Spheres, cylinders, ellipsoids, paraboloids, hyperboloids, cones. Spherical and cylindrical coordinates.

**MAT3521 MATRICES AND COMPLEX NUMBERS (MAT3540 MATRICES AND COMPLEX NUMBERS A)**

**Course Code:** MAT3521
**NQF Level:** 5
**Notional Hours:** 80
**NQF Credits:** 8
**Prerequisite:** None
**Contact Hours:** 2 lectures plus 1 tutorial per week for one semester
**Course Assessment:** Continuous Assessment: 50% (minimum of 2 class tests). Examination: 50% (1 x 2-hour paper).
**Course description: Vectors in 2-and 3-dimensions:** addition of vectors, multiplication by a scalar, norm of a vector, dot product, cross product. Lines and planes in 3D-space. **Systems of linear equations:** introduction to linear systems, solution by Gaussian elimination and Gauss–Jordan elimination (for up to 3 x 3). **Matrices:** addition, multiplication, scalar multiplication, transpose (for up to 3 x 3), elementary matrices, diagonal, triangular and symmetric matrices, determinant and inverse (for up to 3 x 3), solutions of systems of linear equations by Cramer's rule (for up to 3 x 3). **Complex Numbers:** complex planes, operations on complex numbers, modulus, complex conjugate, division, modulus-argument form, de Moivre's formula, Euler's formula, Fundamental Theorem of Algebra.

**PHY3511: PHYSICS FOR PHYSICAL SCIENCES I**

**Course title:** **PHYSICS FOR PHYSICAL SCIENCES I**
**Code:** **PHY3511**
**NQF level:** 5
**Contact hours:** 56 Lectures and 14 Practical Sessions/Tutorials
**Credits:** 16
**Course assessment:** Continuous Assessment (**50%**) and 1 x 3-hour Exam Paper (**50%**)
Continuous Assessment will consist of three (3) class tests, at least two (2) tutorial tests/assignments and practical report(s) consolidated to one (1) practical mark.
**Pre-requisites:** NSSC Physical Science and Mathematics (C-symbols)
**Co-requisites:** None
**Course description:** Units, significant figures & scientific notation; vectors: properties, components, unit vectors, products; average & instantaneous speed, velocity and acceleration; one dimensional motion with constant acceleration; falling bodies; two dimensional motion with constant acceleration; projectile motion; uniform circular motion; circular motion; relative velocity and acceleration; Newton's laws; inertial frames; weight; friction; applications; work and kinetic energy; power; conservative and non-conservative forces; gravitational potential energy; conservation theorem; work-energy theorem; linear momentum & impulse; conservation of linear momentum - 2 particle system; collisions; equilibrium; centre of gravity; applications; Newtonian gravitation; gravitational constant; weight & gravitational force; Kepler's laws; pressure; Archimedes' principle; laminar flow; Bernoulli's equation; temperature & temperature scales; thermal expansion; ideal gas; heat; heat capacity; latent heat; heat transfer.

**CIT3521 FUNDAMENTALS OF INFORMATION TECHNOLOGY I**

**Course Title:** **Fundamentals of Information Technology I**
**Course Code** **CIT3521**
**NQF Level** 5
**Notional Hours** 80
**NQF Credits** 8
**Course Assessment** Continuous Assessment **50%** (Minimum of 2 tests and 2 assignments) Examinations **50%**
**Contact Hours** 2 lecture periods per week and half a practical session per week for one semester
**Prerequisite** None
**Course Descriptions:** This course introduces pervasive Themes in Information Technology and covers the following topics: IT and Its Related Disciplines, Application Domains, History of the Internet; Communications media; Data transmission; Information technology security; Operating systems; Introduction to Web design and Web applications, Web technologies.

**FIRST AND SECOND SEMESTER COURSE**

**CONTEMPORARY SOCIAL ISSUES CSI3580**

| | |
|---|---|
| **Course title:** | **CONTEMPORARY SOCIAL ISSUES CSI3580** |
| **NQF:** | 5 |
| **Credits:** | 8 |
| **Continuous assessment:** | Continuous Assessment **100%**: Quizzes, Tests, Moodle Assignments, Journal Entries, Reflections, Service and Experiential Learning Projects |
| **Prerequisite:** | None |

**Course Content:** The module is designed to encourage behavioural change among UNAM students and inculcate the primacy of moral reasoning in their social relations and their academic lives. In providing students with critical and analytical thinking the module enables students to grow and develop into well rounded citizens, capable of solving contemporary social challenges experienced in their communities and societies. The teaching of the module takes three dimensions: the intellectual, the professional and the personal dimensions. The intellectual dimension is fostered through engaging students with subject knowledge, independent learning and module assessment. The professional dimension, on the other hand, is fostered through exposing students to real life situations of case studies and practical exercises that draws attention to social issues that attract on-going political, public and media attention and/or debate.

**SECOND SEMESTER COURSES**

**LEA3519 ENGLISH FOR ACADEMIC PURPOSES**

| | |
|---|---|
| **Course title:** | **ENGLISH FOR ACADEMIC PURPOSES** |
| **Code:** | **LEA3519** |
| **NQF level:** | 5 |
| **Contact hours:** | 4 periods per week for one semester |
| **Credits:** | 16 |
| **Course assessment:** | Continuous assessment (**60%**): 2 tests (reading and writing), 1 academic written essay, 1 oral presentation Examination **(40%)**: One three-hour examination paper |
| **Prerequisites:** | None |

**Course description:** This course develops a student's understanding, and competencies regarding academic conventions such as academic reading, writing, listening and oral presentation skills for academic purposes. Students are required to produce a referenced and researched essay written in formal academic style within the context of their university studies. Students are also required to do oral presentations based on their essays. The reading component of the course deals with academic level texts. This involves students in a detailed critical analysis of such texts. The main aim is therefore, to develop academic literacy in English.

**CIT3512 FUNDAMENTALS OF INFORMATION TECHNOLOGY II**

| | |
|---|---|
| **Course Title:** | **Fundamentals of Information Technology II** |
| **Course Code** | **CIT3512** |
| **NQF Level** | 5 |
| **NQF Credits** | 16 |
| **Contact Hours** | 4 lecture periods per week and onepractical session per week for one semester |
| **Course Assessment** | Continuous Assessment **50%** (Minimum of 2 tests and 2 assignments) Examinations **50%** |
| **Co-Requisites:** | CIT3521Fundamentals of Information Technology I |

**Course Descriptions:** This course is a follow up on Fundamentals of Information Technology I, and covers the following topics: Introduction to Data Communications; Introduction to Wired and wireless LAN technologies; Introduction to Telecommunications Systems; telecommunications standards and protocols; principles behind telecommunications; Networking fundamentals; Telecommunication Fundamentals; Industry standards, topologies and protocols;

**MAT3512 PRECALCULUS**

| | |
|---|---|
| **Course Code** | **MAT3512** |
| **NQF Level** | **5** |
| **Notional Hours** | **160** |
| **NQF Credits** | **16** |
| **Prerequisite** | **None** |
| **Contact Hours** | **4** lectures plus **1 x 2 hour** tutorial per week for one semester |

**Course description: Functions:** one-to-one, onto and bijective functions, horizontal line test, inverse of a function. **Combinations of functions:** composition of functions, sum, difference, quotient of functions and their domains. Polynomial functions, rational functions and their graphs. Introduction of exponential and logarithmic functions. Trigonometric functions and their graphs, inverse trigonometric functions, trigonometric equations. **Limit of a function:** definition, left and right limits, improper limits, continuity in terms of limits. **Differentiation:** rate of change, derivative of a function, rules of differentiation, derivatives of polynomial and rational functions, increasing and decreasing functions and graph sketching. **Integration:** Antiderivatives (polynomial functions and rational exponents), the definite integral, area under a graph.

**STS 3522 INTRODUCTION TO STATISTICS**

| | |
|---|---|
| **NQF Level:** | 5 |
| **Notional Hours:** | 80 |
| **NQF Credits:** | 8 |
| **Course assessment:** | Continuous assessment (at least two test and two assignments) **40%**; Examination **60%** (1x2hour Examination paper). |
| **Pre-requisite:** | Faculty entry requirements |
| **Compulsory/Elective** | Compulsory |
| **Contact hour:** | 2 lectures plus 1-hour tutorial per week/one semester |

**Course Description:** Terminologies used in statistics; Populations and samples as sources of data; The need for sampling; Probability and non-probability sampling techniques; Summarising data using frequency distributions and graphs; Computation of descriptive statistics for ungrouped and grouped data; Use of the scientific calculator.

**PHY3512: PHYSICS FOR PHYSICAL SCIENCES II**

| | |
|---|---|
| **Course Title:** | PHYSICS FOR PHYSICAL SCIENCES II |
| Code: | PHY3512 |
| **NQF Level:** | 5 |
| **Contact Hours:** | 56 Lectures and 14 Practical Sessions/Tutorials |
| **Credits:** | 16 |
| **Course assessment:** | Continuous Assessment (**50%**) and 1 x 3-hour Exam Paper (**50%**)<br>Continuous Assessment will consist of three (3) class tests, at least two (2) tutorial tests/assignments and practical report(s) consolidated to one (1) practical mark. |
| **Pre-requisites:** | None |
| **Co-requisites:** | PHY3511: Physics for Physical Sciences I |

**Course description:** This course introduces the phenomena associated with electrostatics (charges at rest) and magnetostatics (the magnetic effects associated with steady currents). It also introduces and develops the use of the electric and magnetic field vectors and relates them by considering electromagnetic induction at a classical level. The connection between these fields and conventional circuit parameters R, C and L is developed, together with the techniques to deal with elementary transient phenomena. Sound, basic geometrical optics and radioactivity and its detection are also covered. The contents of this course include: Electric charge; insulators and conductors; Electric force and coulomb's law, Electric field and Gauss's law; Electric potential; Capacitance and capacitors; Direct current; Ohm's law and simple circuits; Magnetic field; Alternating current; Transformers; Phenomenological approach to RL and RC circuits; Basic geometrical optics; Radioactivity and its detection; Sound.

**SECOND YEAR COURSES**

## FIRST SEMESTER COURSES

**MAT3611 CALCULUS I**

| | |
|---|---|
| **Course Code:** | **MAT3611** |
| **NQF Level:** | 6 |
| **Notional Hours:** | 160 |
| **NQF Credits:** | 16 |
| **Prerequisite:** | MAT3512 |
| **Contact Hours:** | 4 lectures plus 2 tutorials per week for one semester |
| **Course Assessment:** | Continuous Assessment: 50% (minimum of 3 class tests). Examination: 50% (1 x 3-hour paper). |

**Course description: Limits and continuity of functions:** limit at a point, improper limits, continuity. **Derivatives:** definition, rules of differentiation, chain rule, derivatives of higher order, implicit differentiation, logarithmic differentiation, derivative of the inverse function, derivatives of exponential and logarithmic functions. **Some applications of the exponential functions:** growth and decay. Derivatives of arc functions (inverse trigonometric functions), derivatives of hyperbolic functions, derivatives of area functions (inverse hyperbolic functions). **Applications of the derivative**: extrema of functions, concavity and curve sketching, applications to optimization problems, related rates. Rolle's Theorem, The Mean Value Theorem, L'Hospital's rule. **Integration:** antiderivatives, integration by substitution.

**MAT3641 NUMERICAL METHODS WITH MATLAB**

| | |
|---|---|
| **Course Code:** | **MAT3641** |
| **NQF Level:** | 6 |
| **Notional Hours:** | 80 |
| **NQF Credits:** | 8 |
| **Prerequisite:** | MAT3521 |
| **Contact Hours:** | 2 lectures plus 1 tutorial per week for one semester |
| **Course Assessment:** | Continuous Assessment: **50%** (minimum of 2 class tests). Examination: **50%** (1 x 2-hour paper). |

**Course description: The MATLAB Environment:** arithmetic operations with MATLAB, matrix algebra with MATLAB, MATLAB scripts, matrix operators, graphic output, flow control, MATLAB functions, system of linear equations. **Numerical Methods:** system of non-linear equations, optimization, interpolation, regression, numerical differentiation, quadrature, differential equations. **Application:** dynamical systems, stochastic processes (e.g. throwing dice, tossing coins and dealing cards), discrete processes (e.g. population dynamics), continuous processes (e.g. chemical reactions and kinetics).

**PHY3651: MECHANICS & WAVES**

| | |
|---|---|
| **Course title:** | **MECHANICS & WAVES** |
| **Code:** | **PHY3651** |
| **NQF level:** | 6 |
| **Contact hours:** | 56 Lectures and 14 Practical Sessions/Tutorials |
| **Credits:** | 16 |
| **Course assessment:** | Continuous Assessment (**50%**) and 1 x 3-hour Exam Paper (**50%**) |
| Continuous | Assessment will consist of three (3) class tests, at least two (2) assignments and practical report(s) consolidated to one (1) practical mark. |
| **Pre-requisites:** | PHY3511: Physics for Physical Sciences I and MAT3512: Precalculus |
| **Co-requisites:** | None |

**Course description:** Vectors, vector operations and the calculus of vectors. Rectilinear and curvilinear motion; Circular motion; Translational & rotational uniform relative motion; Mass; Linear momentum; Newton's Laws; Friction; The linear and quadratic laws of fluid drag; Variable mass systems; Angular momentum; Central forces; Work energy and power; Conservation laws; Rectilinear motion under conservative forces; Non-conservative forces; Centre of mass; Motion of the centre of mass. Linear and angular momentum of a system; Kinetic energy of a system; Conservation laws of a system; Transforming between Laboratory and Centre-of-mass Frames; Reduced mass; Collision Theory; Rutherford scattering; Angular momentum of a rigid body; Moments and products of inertia; Equation of motion for a rotating body; Kinetic energy of rotation; Body on a spring; Classical SHM; Damped SHM; Forced motion; The different kinds of waves; Standing waves on a string; The one dimensional wave equation; Travelling waves: properties; Plane waves; Scalar & vector waves; Reflection and transmission.

**NAV3661 PROPULSION**

| | |
|---|---|
| **Course title:** | **PROPULSION** |
| **Code:** | **NAV3661** |
| **NQA level:** | 6 |
| **Contact hours:** | 2 lecture periods per week for one semester |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | PHY3511 |

**Course description:** Steam propelled Nvala Systems, General Layout of a Steam System, Networks, Accessories and Valves, Heat Exchangers, Fresh Water Generators, Steam Turbines, Operation of a Steam Naval Vessel, Internal Combustion Engines, Gas Turbines and Combined Systems

**NAV3601 SEAMANSHIP**

| | |
|---|---|
| **Course title:** | **SEAMANSHIP** |
| **Code:** | **NAV3601** |
| **NQA level:** | 6 |
| **Contact hours:** | 2 lecture periods per week for one semester. |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | **NONE** |

**Course description:** Seamanship skills and ship handling. Roles and Characteristics of warships, international and inland navigational rules and rules of the road. Maritime background, sea laboratories on 42m Patrol vessel (PV), shore-based bridge simulator laboratories and ship maneuvering.

**SECOND SEMESTER COURSES**

**MAT3612 CALCULUS II**

**Course Code:** **MAT3612**
**NQF Level:** 6
**Notional Hours:** 160
**NQF Credits:** 16
**Prerequisite :** MAT3512
4 lectures plus 2 tutorials per week for one semester
**Course Assessment:** Continuous Assessment: **50%** (minimum of 3 class tests). Examination: **50%** (1 x 3-hour paper)
**Course description: Integration:** Riemann sums and the definite integral, the Fundamental Theorem of Calculus, approximations of the Riemann integral using the trapezoidal rule and Simpson's rule, average value of a function on an interval. **Integration techniques:** integration by parts, reduction formulae, trigonometric substitutions, integration of rational functions. **Applications of the Riemann integral:** area of a region bounded by graphs, volume of a solid of revolution, arc length, surface of revolution. Partial differentiation, chain rule, directional derivatives. Classification of critical points for two-variable functions**. Sequences and series of real numbers:** the limit of a sequence, absolutely convergent series, tests of convergence. **Power series:** radius of convergence, interval of convergence, McLaurin and Taylor series, the Binomial Theorem. Double integration, iterated integrals, use of polar coordinates, application of double integration to finding area and volume. Improper integrals..

**MAT3642 ORDINARY DIFFERENTIAL EQUATIONS**

| | |
|---|---|
| **Course Code:** | **MAT3642** |
| **NQF Level:** | 6 |
| **Notional Hours:** | 80 |
| **NQF Credits:** | 8 |
| **Prerequisite :** | MAT3521 and MAT3512 |
| **Contact Hours:** | 2 lectures plus 1 tutorial per week for one semester |
| **Course Assessment:** | Continuous Assessment: **50%** (minimum of 2 class tests). Examination: **50%** (1 x 2-hour paper). |

**Course description:** First order differential equations, linear differential equations of second order, series solutions of second order linear equations, The Laplace transform, systems of first order linear equations.

**PHY3612: ELECTROMAGNETISM**

| | |
|---|---|
| **Course Title:** | **ELECTROMAGNETISM** |
| **Code:** | **PHY3612** |
| **NQF Level:** | 6 |
| **Credits:** | 16 |
| **Contact Time:** | 56 Lectures and 14 Practical Sessions/Tutorials |
| **Course assessment:** | Continuous Assessment (**50%**) and 1 x 3-hour Exam Paper (**50%**)<br>Continuous Assessment will consist of three (3) class tests, at least two (2) tutorial tests/assignments and practical report(s) consolidated to one (1) practical mark. |
| **Pre-requisites:** | PHY3512: Physics for Physical Sciences II and MAT3512: Precalculus |
| **Co-requisites:** | None |

**Model description:** This course will provide students with information on how the charges at rest and those in motion behave. This course will be calculus-based and students will develop the skill to obtain different equations and solve related problems. The contents of the course are: Electric interaction; Static electric charge and Gauss's Law; Electric potential; Capacitors; Electric current; Ohm's law; Resistance, Joule effect and emf; Magnetic interaction; Lorentz force; Electromagnetic field of a moving charge; Electric flux of a moving charge; Magnetic field and electric current; Magnetostatics; Ampere's law; Time dependent electric field; Maxwell's equations.

**NAV3642 SHIP STABILITY AND CONTROLS**

| | |
|---|---|
| **Course title:** | **SHIP STABILITY AND CONTROLS** |
| **Code:** | **NAV3642** |
| **NQA level:** | 6 |
| **Contact hours:** | 2 lecture periods per week for one semester. |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | Co-requisite: NAV3601 |

**Course description:** Drydocking: metacentric height, MM' and GG' methods. Critical period, GM at critical instant. Intact condition: IMO standard, simplified data, curves of Righting Levers. Inclining Experiment: theory and practice, density and hydrostatic information. Stability characteristics and problems. Vessel rolling and damage stability. Longitudinal stress: buoyancy, shear, load, and bending moment curves. Manoeuvrability: frictional resistance, shallow water, ship to ship and ship to shore interactions. Angle of heel and draft when turning at speed.

**NAV3622 MARITIME HISTORY**

| | |
|---|---|
| **Course title:** | **MARITIME HISTORY** |
| **Code:** | **NAV3622** |
| **NQA level:** | 6 |
| **Contact hours:** | 2 lecture periods per week for one semester. |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | NONE |

**Course description:** Historiography, Ancient times, **Age of Navigation**, Ships and vessels, Arab age of discovery, Hanseatic League, Somali maritime enterprise, **Age of Discovery**, European expansion, European colonization, Clipper route, End of exploration, **Age of Sail**, Notable individuals, Spanish and English Armadas, North American maritime, War of 1812, *Challenger* expedition, End of the sail, **Submarines, Age of Steam,** Rise of the steam vessels, Greek War of Independence, 1850 to the End of the Century, **20th century**, Maritime events of World War I, Maritime events of World War II, Battle of the Atlantic, Pacific War, Latter half of the 20th century, Cuban Missile Crisis, Gulf of Tonkin Incident, Falklands War, Panama canal handover, Namibian Navel History, **21st century**, Piracy.

| **NAV3652** | **MARINE RADIO COMMUNICATIONS** |
|---|---|
| **Course title:** | **MARINE RADIO COMMUNICATIONS** |
| **Code:** | **NAV3652** |
| **NQA level:** | 6 |
| **Contact hours:** | 4 lecture periods per week for one semester and one 3-hour practical session per week for one semester. |
| **Credits:** | 16 |
| **Course assessment:** | Continuous assessment **50%** (at least 3 class tests**,** 2 practical reports and assignments) Written Examination **50%**: 1x3 hour theory paper |
| **Prerequisites:** | CIT3512 |

**Course description:** Radio propagation, Marine Communications, Coast Radio and Limited Coast Stations, Power Supplies, Marine Radion Communications Equipment, Digital Selective Calling, Emergency Position Indicating Radio Beacons, Search and Rescue Transponders, Distress Urgency and Safety Communication using radiotelephony, Operating Procedures for routine communications, Maritime communication satellite systems and equipment, GMDSS.

**YEAR 3**

**FIRST SEMESTER COURSES**

| **PHY3711: ELECTRODYNAMICS** | |
|---|---|
| **Course title:** | **ELECTRODYNAMICS** |
| **Code:** | **PHY3711** |
| **NQF Level:** | 7 |
| **Contact hours:** | 56 Lectures and 14 Practical Sessions/Tutorials |
| **Credits:** | 16 NQF credits |
| **Course assessment:** | Continuous Assessment (**50%**) and 1 x 3-hour Exam Paper (**50%**)<br>Continuous Assessment will consist of three (3) class tests, at least two (2) tutorial tests/assignments and practical report(s) consolidated to one (1) practical mark. |
| **Pre-requisites:** | PHY3612: Electromagnetism and MAT3612: Calculus II |
| **Co-requisites:** | None |

**Course description:** The following topics are covered in Electrodynamics: Vector analysis, with emphasis on the 'del' operator , integral calculus, curvilinear coordinate systems; The electrostatic field E and its divergence and curl, Gauss's law; The electric potential, Poisson's equation and Laplace's equation; Work and energy in electrostatics, induced charges on conductors and capacitors; Uniqueness theorems and method of images as special techniques for solving some problems; The electric field of a dipole; Electric field in matter – polarization, linear dielectrics, electric displacement; Magnetostatics field B – Lorentz force law, Biot-Savart law, divergence and curl of B, Ampère's law, magnetic vector potential; Magnetic fields in matter – magnetization and the auxiliary field H; Electrodynamics – Ohm's law, Faraday's law, Maxwell's equations in vacuum and in matter, conservation laws, Poynting's theorem.

| **ARM3721** | **MILITARY PSYCHOLOGY** |
|---|---|
| **Course title:** | **MILITARY PSYCHOLOGY** |
| **Code:** | **ARM3721** |
| **NQA level:** | 7 |
| **Contact hours:** | 2 lecture periods per week for one semester |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | **NONE** |

**Course description:** Personality theory and war: role of personality and personality theory of Jung, adjustment psychology: maladjustment and adolescent, transition in military training. Operational psychology: psychological effects of combat, post-traumatic stress disorder. Peacekeeping psychology: model to support soldiers and their dependants, stressors and prisoner of war. Psychological warfare: ethics in war operations.

| **ARM3741** | **MILITARY MANAGEMENT** |
|---|---|
| **Course title:** | **MILITARY MANAGEMENT** |
| **Code:** | **ARM3741** |
| **NQA level:** | 7 |
| **Contact hours:** | 2 lecture periods per week for one semester |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | **NONE** |

**Course description:** Management: general, environment and diversity. Planning: skills, creative problem solving, strategy and operational processes and organising skills. Organising and delegation; management of change; Leadership skills; group and team development, power, conflict and stress, control of human resources and finance controls in organization.

| **NAV3711** | **NAVIGATION AND NAVAL OPERATIONS** |
|---|---|
| **Course title:** | **NAVIGATION AND NAVAL OPERATIONS** |
| **Code:** | **NAV3711** |
| **NQA level:** | 7 |
| **Contact hours:** | 4 lecture periods per week for one semester. |
| **Credits:** | 16 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x3 hour theory paper |
| **Prerequisites:** | NAV3601 |

**Course description:** Piloting, ship handling skills, basic navigation and rules of the nautical road. Visual and electronic navigation aids, magnetic and gyro compasses and global positioning system satellites. Fundamentals: standing and underway replenishment. Command and control, navigation and naval operation accidents. Voyage planning, contact tracking on maneuvering boards. Charts: navigation and concepts of coordinates. Distances: measurements, calculations, speeds, times and directions.

| NAV3741 | ELECTRONICS I |
|---|---|
| **Course title:** | **ELECTRONICS I** |
| **Code :** | **NAV3741** |
| **NQA level:** | 7 |
| **Contact hours:** | 2 lecture periods per week for one semester and one 3-hour practical session per week for one semester. |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | PHY3612 |

**Course description:** Semiconductor: p-type, n-type, and p-n junction. Diodes, BJT, transistor construction, the Common-Base (CB) , the Common-Emitter (CE) , the Common-Collector (CC) configurations. JFET: the junction field-effect transistor. MOSFET: the enhancement, depletion, inverter and logic gates. Small signal amplifiers, CE, CC, CB transistor amplifiers, hybrid model of the transistor, CS, CD, CG Fet amplifiers, cascade amplifiers, negative feedback, negative feedback-circuits analysis, response of the high frequency amplifers, Bode diagrams, operational amplifers.

| NAV3761 | ELECTRO-TECHNIQUES |
|---|---|
| **Course title:** | **ELECTRO-TECHNIQUES** |
| **Code:** | **NAV3761** |
| **NQA level:** | 7 |
| **Contact hours:** | 2 lecture periods per week for one semester and one 3-hour practical session per week for one semester. |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | PHY3612 |

**Course description:** Direct current engines, asynchronous motors, synchronous engines and alternators. Electrical measurements, tests and safety. Rectifiers: half-bridge, full-bridge and controlled rectifier. Maximum reverse voltage and current, commutation problems, power factor and harmonic distortion. Electric distribution, protection and AC engines. Alternators: voltage regulation, synchronization, load sharing and external characteristics.

**SECOND SEMESTER COURSES**

| AER3732 | RESEARCH METHODOLOGY |
|---|---|
| **Course title:** | **RESEARCH METHODOLOGY** |
| **Code:** | **AER3732** |
| **NQA level:** | 7 |
| **Contact hours:** | 2 lecture periods per week for one semester |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | STS3522 |

**Course description:** Various philosophy of science, research proposals (guidance to write good project proposals). Basic research skills (e.g., library research, literature review, article analysis, etc.,). Research strategy: planning, designing and implementing. Data collection and interpretation methods, data reduction, error analysis (error propagation). Data analysis, report writing, communication, skill required to communicate research findings to a broader audience, presentations, (oral and written). Peer reviewing, refereed Journals, ethics and legal issues (e.g. Plagiarism). Basic quantitative research (concerned with the tabulation or numeric relevance of various kinds of behavior (measuring). Basic of qualitative research.

**PHY3752 MODERN PHYSICS**

| | |
|---|---|
| **Course title:** | **MODERN PHYSICS** |
| **Code:** | **PHY3752** |
| **NQF Level:** | 7 |
| **Contact hours:** | 56 Lectures and 14 Practical Sessions/Tutorials |
| **Credits:** | 16 |
| **Course assessment:** | Continuous Assessment (**50%**) and 1 x 3-hour Exam Paper (**50%**)<br>Continuous Assessment will consist of three (3) class tests, at least two (2) tutorial tests/assignments and practical report(s) consolidated to one (1) practical mark. |
| **Pre-requisites:** | MAT3612: Calculus II and **either** PHY3651: Mechanics & Waves or PHY3612: Electromagnetism |
| **Co-requisites:** | None |

**Course description:** The Birth of Modern Physics: Classical physics of the 1890s, nature of light, the initial atomic theory of matter, problems in 19th-century physics;Special Theory of Relativity: The need for aether, the Michelson-Morley experiment, Einstein's postulates, Lorentz transformation, time dilation and length contraction, addition of velocities, experimental verifications, the twin paradox, space-time and Minkowski diagrams, doppler effect, relativistic momentum, relativistic energy, electromagnetism and relativity, four vectors;Overview of General Relativity：A brief and qualitative descriptive view of: tenets of: General Relativity, tests of General Relativity, gravitational waves, black holes, and frame dragging;Experimental Basis of Quantum Theory: discovery of the X-ray and the Electron, determination of the electron charge, line spectra, blackbody radiation, photoelectric effect, Compton effect;Structure of the Atom: atomic models of Thomson and Rutherford, Rutherford scattering, the classic atomic model, the Bohr Model of the hydrogen atom, successes and failures of the Bohr model, Mosley's law, Franck-Hertz experiment;Wave Properties of Matter and Quantum Mechanics: X-ray scattering, De Broglie waves, electron scattering, particle-wave duality, Heisenberg uncertainty relation, probability, wave functions, the Schrödinger wave equation, expectation values, infinite square-well potential, finite square-well Potential, barriers and tunneling, quantum numbers, Zeeman effect, Lande g factor, spin-orbit interaction;Lasers: stimulated emission, gain and inversion, rate equations, three- and four-level systems, threshold energy, laser applications.

| **NAV3742** | **ADVANCED NAVIGATION** |
|---|---|
| **Course title:** | **ADVANCED NAVIGATION** |
| **Code:** | **NAV3742** |
| **NQA level:** | 7 |
| **Contact hours:** | 2 lecture periods per week for one semester. |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | NAV3711 |

**Course description:** Vessel bridge resource management, vessels' shore stations, formal safety assessment (FSA) of vessels, traffic separation schemes and marine accidents.

| **NAV3752** | **ELECTRONICS II** |
|---|---|
| **Course title:** | **ELECTRONICS II** |
| **Code:** | **NAV3752** |
| **NQA level:** | 7 |
| **Contact hours:** | 4 lecture periods per week for one semester and one 3-hour practical session per week for one semester. |
| **Credits:** | 16 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x3 hour theory paper |
| **Prerequisites:** | NAV3741 |

**Course description:** Circuits and op-amps applications. Oscillators: Sinusoidal wave generators, negative and positive feedback concepts, Berkhausen Criteria, Oscillator design methods, Colpitts and Hartley Oscillators, Wien Bridge Oscillators. Square wave and Triangle Wave generators. Multivibrators: Monostable, Bistable and Astable circuits, Schmitt Triggers, Timer circuits and 555 IC, Active filters, Butterworth and Chebishev active filters. Power Amplifiers: A, AB, C and D class, UJT Transistors. Electronics circuit design, Thrystor, triac and diac elements.

**YEAR 4**

**FRIST AND SECOND SEMESTER COURSE**

| **NAV3810** | **RESEARCH PROJECT** |
|---|---|
| **Course title:** | **RESEARCH PROJECT** |
| **Code:** | **NAV3810** |
| **NQA level:** | 8 |
| **Contact hours:** | 2 consultation periods per week for one semester |
| **Credits:** | 32 |
| **Course assessment:** | Continuous assessment: 100% (Oral presentation of research proposal – 10%; written research proposal – 20%, oral presentation of results – 20%, written research report - 50%). |
| **Prerequisites:** | AER3732 |

**Course description:** Identification of research topic; literature review, data collection, analysis, proposal development, presentation, evaluation and report writing.

**FIRST SEMESTER COURSES**

| **NAV3801** | **ASTRO-NAVIGATION** |
|---|---|
| **Course title:** | **ASTRO-NAVIGATION** |
| **Code:** | **NAV3801** |
| **NQA level:** | 8 |
| **Contact hours:** | 2 lecture periods per week for one semester and one 3-hour practical session per week for one semester. |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | AER3742 |

**Course description:** Celestial Navigation theory, cartography and astronomy, Bowditch, Sextant, index error, star-finder, navigationalstars and planets, electronic navigation, celestial measurements**,** the Nautical Almanac, sight reduction tables, Pilot and Great Circle charts.

| **ARM3831** | **MILITARY LEADERSHIP** |
|---|---|
| **Course title:** | **MILITARY LEADERSHIP** |
| **Code:** | **ARM3831** |
| **NQA level:** | 8 |
| **Contact hours:** | 4 lecture periods per week for one semester |
| **Credits:** | 16 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x3 hour theory paper |
| **Prerequisites:** | ARM3741 |

**Course description:** Leadership ethics, types and style of leadership, roles and ethics of commander, obedience and order, application of military ethics, code of conduct of the NDF and the Constitution of Namibia.

| **NAV3809** | **SIGNALS AND SYSTEMS** |
|---|---|
| **Course title:** | **SIGNALS AND SYSTEMS** |
| **Code:** | **NAV3809** |
| **NQA level:** | 8 |
| **Contact hours:** | 2 lecture periods per week for one semester and one 3-hour practical session per week for one semester. |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | NAV3741 &NAV3752 |

**Course description:** Circuit analysis, transmission of signals, linear systems and natural frequencies. Pole-zero diagrams: governing system equations and transform techniques. Systems analysis: continuous-time and discrete-time systems. Computer software and modeling.

**PHY3809: ADVANCED ELECTRODYNAMICS**

| | |
|---|---|
| **Course title:** | **ADVANCED ELECTRODYNAMICS** |
| **Code:** | **PHY3809** |
| **NQF Level:** | 8 |
| **Contact hours:** | 28 Lectures and 7 Practical Sessions/Tutorials |
| **Credits:** | 8 NQF credits |
| **Course assessment:** | Continuous Assessment (**50%**) and 1 x 2-hour Exam Paper (**50%**)<br>Continuous Assessment will consist of two (2) class tests, at least two (2) assignments and practical report(s) and/or presentation(s) consolidated to one (1) practical mark |
| **Pre-requisites:** | PHY3711: Electrodynamics |
| **Co-requisites:** | None |

**Course description:** This course is a follow-up on the course Electrodynamics and constitute the following topics: Conservation laws in electrodynamics; Vector and scalar potential formulation; Coulomb and Lorentz transformations; Retarded potentials and Jefimenko's equations; Lièнard-Wiechert potentials; Electric and magnetic dipole radiation, power radiated; Linear Antennas; Electrodynamics and relativity – relativistic magnetism, field transformation, field tensor.

| **NAV3861** | **DIGITAL ELECTRONICS** |
|---|---|
| **Course title:** | **DIGITAL ELECTRONICS** |
| **Code:** | **NAV3861** |
| **NQA level:** | 8 |
| **Contact hours:** | 2 lecture periods per week for one semester and one 3-hour practical session per week for one semester. |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | NAV3752 |

**Course description:** Electronic Components and Circuits: Resistors, capacitors, diodes, transistors, CMOS logic gates, Ohm's and Kirchhoff's Laws. Logic Circuits and gates: AND, OR, NAND, NOR, NOT, Truth tables, Adders, Shift registers, Boolean Algebra, Laws of Commutation, Association, Duality, De Morgan, Fan-in and Fan-out. Number Systems: Decimal, Binary, Hexadecimal, Octal Conversion, ASCII and BCD. Registers: RS, D-Type, Single Byte and Byte transfer. MUX/DE-MUX: Multiplexer logic and truth tables, Use in registers, De-multiplexer logic and truth tables, Use in registers and Tri-state. Data Conversion: A/D and D/A techniques. Microcontrollers: The PIC as an example, Types of computer, Stored Program Control, Arithmetic and Logic Unit, Input/Output, Memory, Control Unit and Clock.

| **NAV3881** | **DIGITAL TECHNIQUES** |
|---|---|
| **Course title :** | **DIGITAL TECHNIQUES** |
| **Code:** | **NAV3881** |
| **NQA level:** | 8 |
| **Contact hours:** | 2 lecture periods per week for one semester and one 3-hour practical session per week for one semester. |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | NAV3741 &NAV3752 |

**Course description:** Number systems, codes, combinational logic, sequential logic, MSI circuits, sequential circuits, digital arithmetic and circuits, schematic entry and programming of PLDs, J-K flip-flops, monostable circuit, astable multi-vibrator, binary synchronous and asynchronous counters.

**SECOND SEMESTER COURSES**

| **NAV3809** | **SIGNALS AND SYSTEMS** |
|---|---|
| **Course title:** | **SIGNALS AND SYSTEMS** |
| **Code:** | **NAV3809** |
| **NQA level:** | 8 |
| **Contact hours:** | 2 lecture periods per week for one semester and one 3-hour practical session per week for one semester. |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | NAV3741 &NAV3752 |

**Course description:** Circuit analysis, transmission of signals, linear systems and natural frequencies. Pole-zero diagrams: governing system equations and transform techniques. Systems analysis: continuous-time and discrete-time systems. Computer software and modeling.

| PHY3802: NUCLEAR PHYSICS | |
|---|---|
| **Course title:** | **NUCLEAR PHYSICS** |
| **Code:** | **PHY3802** |
| **NQF Level:** | 8 |
| **Contact hours:** | 28 Lectures and 7 Practical Sessions/Tutorials |
| **Credits:** | 8 |
| **Course assessment:** | Continuous Assessment (**50%**) and 1 x 2-hour Exam Paper (**50%**)<br>Continuous Assessment will consist of two (2) class tests, at least two (2) assignments and practical report(s) and/or presentation(s) consolidated to one (1) practical mark |
| **Pre-requisites:** | PHY3752: Modern Physics |
| **Co-requisites:** | None |

**Course description::** Nuclear Structure, nuclear radius, nomenclature; Decay of the nucleus, alpha decay, beta decay, gamma decay, spontaneous fission; Radioactivity, radioactive growth and decay, transient equilibrium, secular equilibrium, radioactive decay series, carbon dating; Chart of Nuclides; Nuclear reactions, elastic scattering, inelastic scattering, reaction of transmutation, radiative capture, photodisintegration, induced fission; Interaction of radiation with matter, photoelectric effect, pair production, Compton scattering, calculation of energy transferred in Compton scattering using relativistic equations; The liquid drop model, variation of binding energy per nucleon with mass number; Weizsacher's semi-empirical mass formula; The shell model; Nuclear energy, nuclear reactors, introductory reactor physics, nuclear power plants; Nuclear instrumentation, radiation detectors, accelerators; Two body systems and nuclear force: properties of nuclear forces, the deuteron, qualitative treatment of n-p and p-p scattering at low energies; Elementary particle.

| NAV3822 | NAVAL WARFARE |
|---|---|
| **Course title:** | **NAVAL WARFARE** |
| **Code:** | **NAV3822** |
| **NQA level:** | 8 |
| **Contact hours:** | 2 lecture periods per week for one semester and one 3-hour practical session per week for one semester. |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | None |

**Course description:** Review of military history, age of Galley Warfare, age of sail, war evolution, age of the battleship. Naval Warfare up to World War II. Propulsion and technological advances: weapon systems, nuclear power and missiles. Art and science of naval warfare, doctrine and amphibious operations.

| NAV3812 | ELECTRIC-MACHINES AND DRIVES |
|---|---|
| **Course title:** | **ELECTRIC-MACHINES AND DRIVES** |
| **Code:** | **NAV3812** |
| **NQA level:** | 8 |
| **Contact hours:** | 4 lecture periods per week for one semester and one 3-hour practical session per week for one semester. |
| **Credits:** | 16 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x3 hour theory paper |
| **Prerequisites:** | NAV3761 |

**Course description:** Electrical Machinery Power Systems. Machines: direct current (DC), induction, electrical, synchronous, harmonic, losses and Residual Flux. Single and three phase transformers. Park transformation, simulation of the electrical machines with MATLAB/Simulink and effects of saturation.

| NAV3842 | THEORY AND APPLICATIONS OF LASERS |
|---|---|
| **Course title:** | **THEORY AND APPLICATIONS OF LASERS** |
| **Code:** | **NAV3842** |
| **NQA level:** | 8 |
| **Contact hours:** | 2 lecture periods per week for one semester and one 3-hour practical session per week for one semester. |
| **Credits:** | 8 |
| **Course assessment:** | Continuous assessment **50%**: Examination **50%**: 1x2 hour theory paper |
| **Prerequisites:** | PHY3612 |

**Course description:** Applications of lasers, lasers in photonics technology, basic operation of laser oscillators, laser theories, operational characteristics of lasers and properties of lasers.

## D.6. POSTGRADUATE DIPLOMA IN SECURITY AND STRATEGIC STUDIES 21PDSS

### *D.6.1. REGULATION PERTAINING TO POSTGRADUATE DIPLOMA STUDIES*

#### *D.6.1.1. ADMISSION REQUIREMENTS*

a) Prospective students must be in possession of a Bachelor's degree or an equivalent degree from the University of Namibia or any other recognized institution of higher learning.

b) Students who do not comply with (1) above, but possess senior military qualifications such as Senior Staff and Command Courses and Ten (10) years of experience, in a senior management/command position may also be considered for admission.

c) Prospective students will be required to write a one-page submission to articulate the goals of their undertaking the Postgraduate studies, and the Faculty reserves the right to interview applicants.

d) Submission of an application for admission to the Postgraduate Diploma in Security and Strategic Studies programme does guarentee admission to the programme.

### *D.6.2. MODE OF DELIVERY*

This programme will be offered on a block release basis. The mode of teaching will include lectures, assignments (individual/group), seminars etc.

### *D.6.3. DURATION OF STUDY*

The duration of the programme is one year. The maximum duration for this programme is two years.

### *D.6.4. ASSESSMENT CRITERIA*

The studies, examination procedures, and admission to examinations for the Postgraduate Diploma in Security and Strategic Studies (PDSSS) will be governed by the University of Namibia examination regulations.
a) Continuous assessment: 50% b) Final Examination (paper 1x3 hours): 50%

Pass requirements - A student must obtain a minimum of 40% in continuous assessment to qualify for admission to examinations and a minimum of 50% to pass a particular course. Where summative assessment in the form of examination is not applicable, a student must obtain a minimum of 50% from continuous assessment, comprising of not less than two assessable tasks to pass the course.

### *D.6.5. REQUIREMENTS FOR QUALIFICATION AWARD*

The Postgraduate Diploma in Security and Strategic Studies (PDSSS) will be awarded to students credited with a minimum number of 152 credits, and who have met the requirements of 136 credits from compulsory and 16 credits from elective courses.

**QUALIFICATION: POSTGRADUATE DIPLOMA IN SECURITY AND STRATEGIC STUDIES 21PDSS**

| Course code | Course Title | NQF Level | Pre-requisite | NQF Credits |
|---|---|---|---|---|
| | **Semester 1** | | | |
| UAE 4819 | Academic Writing for Postgraduate Students | 8 | None | NCB |
| MSS 4811 | Research Methodology | 8 | None | 16 |
| MSS 4831 | Contemporary World Politics | 8 | None | 16 |
| MSS 4851 | National and Human Security | 8 | None | 16 |
| MSS 4871 | Democratic Government and the Security Sector | 8 | None | 16 |
| | **Total Credits Semester 1** | | | **64** |
| | **Semester 2** | | | |
| MSS 4812 | Research Project | 8 | MSS 4811 | 16 |
| MSS 4832 | Introduction to Public Policy Process | 8 | None | 16 |
| MSS 4852 | Strategic Studies and management | 8 | None | 16 |
| | **ELECTIVES: SELECT ONLY ONE** | | | |
| MSM 4812 | Military History of Africa (capita selecta) (compulsory for members of defence) | 8 | None | 16 |
| MSD 4812 | Diplomacy Theory and Practice (compulsory for members from Foreign Affairs.) | 8 | None | 16 |
| MSP 4812 | Political Economy of Food Security (compulsory for Agric & Forestry) | 8 | None | 16 |
| MSP 4832 | Public Safety and Rule of Law (compulsory for members from Safety & Sec.) | 8 | None | 16 |
| MSI 4812 | International, Regional and Sub-Regional Organisations | 8 | None | 16 |
| MSR 4812 | Conflict Resolutions | 8 | None | 16 |
| | **Total Credits Semester 2** | | | **64** |
| | **TOTAL CREDITS** | | | **128** |

*The electives will be offered depending on the expertise available.
*UAE4819 is a non-contributory course

## D.7. POSTGRADUATE DIPLOMA IN SECURITY AND STRATEGIC STUDIES CURRICULUM COURSE DESCRIPTIONS

**FIRST YEAR**

**UAE4819 ACADEMIC WRITING FOR POSTGRADUATE STUDENTS**

| | |
|---|---|
| **Course title:** | Academic Writing for Postgraduate Students |
| **Code** | UAE4819 |
| **NQF level:** | 8 |
| **Contact hours:** | 4 lecture periods / week for one semester per week |
| **Credits:** | NCB |
| **Course Assessment:** | Continuous Assessment **50%** (Minimum of 2 tests and 2 assignments) Final Examinations **50%** |
| **Prerequisites:** | None |

**Course description:** The module will inter alia cover the following issues: Access various academic sources; critical analyses of a text; process approach in research writing; write an academic text using proper rhetoric and style; format a written academic text in APA (American Psychological Association) style.

**MSS4811 RESEARCH METHODOLOGY**

| | |
|---|---|
| **Course title:** | Research Methodology |
| **Code:** | MSS4811 |
| **NQF level:** | 8 |
| **Contact hours:** | 56 contact hours |
| **Credits:** | 16 |
| **Course Assessment:** | Continuous Assessment **50%** (Minimum of 2 tests and 2 assignments) Examinations **50%** |
| **Prerequisites:** | None |

**Course Description:** introduction to research; research ethics; research design techniques; structure of a research work; literature survey; data collection; analysis and validation of data.

**MSS4832 INTRODUCTION TO PUBLIC POLICY PROCESS**

| | |
|---|---|
| **Course title:** | Introduction to Public Policy Process |
| **Code:** | MSS4832 |
| **NQF level:** | 8 |
| **Contact hours:** | 56 contact hours |
| **Credits:** | 16 |
| **Course Assessment:** | Continuous Assessment **50%** (Minimum of 2 tests and 1 assignment) Final Examinations **50%** 1 x 3-hour paper |
| **Prerequisites:** | None |

**Course Description:** definition of policy; content and operational scope of public policy; policy theories and typologies; the rationale behind policy formulation; knowing who the policy stakeholders are and what roles they play in the policy process; and the synergy between public policy formulation and formation.

**MSS4831 CONTEMPORARY WORLD POLITICS AND CONFLICTS**

| | |
|---|---|
| **Course title:** | Contemporary World Politics and Conflicts |
| **Code:** | MSS4831 |
| **NQF level:** | 8 |
| **Contact hours:** | 56 contact hours |
| **Credits:** | 16 |
| **Course Assessment:** | C A **50%** (Minimum of 2 tests and 1assignment) Final Examinations **50%** 1 x 3-hour paper |
| **Prerequisites:** | None |

**Course Description:** introduction to competing theories and practices of contemporary world politics; multi-polarity; globalization, conflict and security in the international system; regional and global security co-operation; regional integration; evolving security communities; governance of global and regional security.

**MSS4851 NATIONAL AND HUMAN SECURITY**

| | |
|---|---|
| **Course title:** | National and Human Security |
| **Code:** | MSS4851 |
| **NQF level:** | 8 |
| **Contact hours:** | 56 contact hours |
| **Credits:** | 16 |
| **Course Assessment:** | C **50%** (Minimum of 2 tests and 1 assignment) Final Exam **50%** 1 x 3-hour paper |
| **Prerequisites:** | None |

**Course Description:** the genesis and development of human security as a social construct; the nexus between state and human security; an exploration of the policy templates of politics and security that it implies; human security fractures culled from Southern Africa and elsewhere; theories of conflict at the micro-, meso - and macro levels of society

| MSS4871 | DEMOCRATIC GOVERNANCE AND THE SECURITY SECTOR |
|---|---|
| **Course title:** | Democratic Governance and the Security Sector |
| **Code:** | MSS4871 |
| **NQF level:** | 8 |
| **Contact hours:** | 56 contact hours |
| **Credits:** | 16 |
| **Course Assessment:** | CA **50%** (Minimum of 2 tests and 1 assignment) Final Exam **50**% 1 x 3-hour paper |
| **Prerequisites:** | None |

**Course Description:** an overview of the components of the security sector and their roles and functions; the architecture and locus of the security sector and its relationships to the justice sector and other relevant sectors; regional security challenges; the African Peace and Security Council and its supportive structures; the evolving security architecture of SADC (the Organ on Politics, Defence and Security Co-operation); the global security environment in the post-Cold War world; the 'War of Terror' and its implications for the security sector; the concept of democratic governance and its implications; the roles of the executive, the legislature, ministries, government departments; post-conflict peace-building and reconstruction; key challenges in the security sector: justice, intelligence and defence.

| MSR4812 CONFLICT RESOLUTIONS | |
|---|---|
| **Course title:** | Conflict Resolutions |
| **Code:** | MSR4812 |
| **NQF level:** | 8 |
| **Contact hours:** | 56 contact hours |
| **Credits:** | 16 |
| **Course Assessment:** | CA **50%** (Minimum of 2 tests and 1 assignment) Final Exam **50%** 1 x 3-hour paper |
| **Prerequisites:** | None |

**Course Description:** conflict research and crafting environmental conflict assessment; from conflict analysis and management to conflict transformation/resolution – a selection of different approaches and models (the formula-detail model; heuristic models; options research; game theory; transcendence; arbitration; mediation; negotiations; post-conflict reconstruction and peace-building); appropriate case studies of both resolved and un-resolved conflicts in Africa and elsewhere; conflict and creativity – generating ideas and options with the parties in conflict.

| MSP4812 | POLITICAL ECONOMY OF FOOD SECURITY |
|---|---|
| **Course title:** | Political Economy of Food Security |
| **Code:** | MSP4812 |
| **NQF level:** | 8 |
| **Contact hours:** | 56 contact hours |
| **Credits:** | 16 |
| **Course Assessment:** | CA **50%** (Minimum of 2 tests and 1 assignment) Final Exam **50%** 1 x 3-hour paper |
| **Prerequisites:** | None |

**Course Description:** Food security, economic liberation and globalization; implications and responses of the trade-offs between biofuels (energy security) and livelihoods (food security); climate variability and change and the resulting competition for resources such as land, water, etc. as well as the relevant adaptation policy and strategic responses; the potential as well as real impact of natural and other hazards – e.g. epidemics, floods, cyclones, fires, earthquakes etc.; food vulnerability and differentiated impact – focusing on among others on the needs of children, the elderly and women.

| MSI4812 INTERNATIONAL, REGIONAL AND SUB-REGIONAL ORGANISATIONS | |
|---|---|
| **Course title:** | International, Regional and Sub-regional Organisations |
| **Code:** | MSI4812 |
| **NQF level:** | 8 |
| **Contact hours:** | 56 contact hours |
| **Credits:** | 16 |
| **Course Assessment:** | CA **50%** (Minimum of 2 tests and 1 assignment) Final Examinations **50%** 1 x 3-hour paper |
| **Prerequisites:** | None |

**Course Description:** The module will outline the various theoretical explanations roles of international organizations. This module will also consider the role of the United Nations, specifically in relation to peace and security issues including collective security, peace-keeping, humanitarian intervention and post-conflict peace-building and reconstruction. The module also offers analysis of the origin of regionalist impulses in Africa. It examines the background, challenges and achievements of regional formations on the continent. More specifically, the module examines the emergence and demise of the OAU as well as the prospects of the African union (AU). The module also studies the dynamics of such regional organizations such as the ECOWAS, SADC and the revived East African Community.

| MSS4812 RESEARCH PROJECT | |
|---|---|
| **Course title:** | Research Project |
| **Code:** | MSS4812 |
| **NQF level:** | 8 |
| **Contact hours:** | 56 contact hours |
| **Credits:** | 16 |
| **Course Assessment:** | C A**50%** (Minimum of 2 tests and 1 assignment) Final Examinations **50%** 1 x 3-hour paper |
| **Prerequisites:** | None |

**Course Description:** identification of research topics, data collection techniques, data interpretation, referencing style (APA).

**MSS4852 STRATEGIC STUDIES AND MANAGEMENT**

| | |
|---|---|
| **Course title:** | Strategic Studies and Management |
| **Code:** | MSS4852 |
| **NQF level:** | 8 |
| **Contact hours:** | 56 contact hours |
| **Credits:** | 16 |
| **Course Assessment:** | C A 50**%** (Minimum of 2 tests and 1 assignment) Final Exam **50%** 1 x 3-hour paper |
| **Prerequisites:** | None |

**Course Description:** Topics include strategic management overview, strategy formulation, strategy implementation and evaluation, strategic planning approaches fundamental to national security policy formulation, alternative approaches to strategy formulation, environmental scanning and scenario planning, strategy alignment with structure, control and reward.

**MSM4812 MILITARY HISTORY OF AFRICA (CAPITA SELECTA)**

| | |
|---|---|
| **Course title:** | Military History of Africa (capita selecta) |
| **Code:** | MSM4812 |
| **NQF level:** | 8 |
| **Contact hours:** | 56 contact hours |
| **Credits:** | 16 |
| **Course Assessment:** | C A **50%** (Minimum of 2 tests and 1 assignment) Final Exam 50**%** 1 x 3-hour paper |
| **Prerequisites:** | None |

**Course Description:** theory and practice of internal conflict with an emphasis on the struggle for political power in Namibia; relationship between war and politics (reciprocal relationship between war and economy and war and society); international conflict or low-intensity conflict; intra-state conflict; terrorism; peacekeeping; cold war and post-cold war trends; the nature of military force and its conventional use in domestic and international environment; conventional thinking and warfare in the air; land and maritime environment.

**MSD4812 DIPLOMACY THEORY AND PRACTICE**

| | |
|---|---|
| **Course title:** | Diplomacy Theory and Practice |
| **Code:** | MSD4812 |
| **NQF level:** | 8 |
| **Contact hours:** | 56 contact hours |
| **Credits:** | 16 |
| **Course Assessment:** | Continuous Assessment **50%** (Minimum of 2 tests and 1assignment) Final Examinations **50%** 1 x 3-hour paper |
| **Prerequisites:** | None |

**Course Description:** diplomacy in a bipolar environment after the Second World War; the impact of the end of the Cold War, international instability, new threats to security and international emergencies had; as well as on protocols, treaties, conventions and sanctions; comparative political systems; international organisations geopolitics; international conflicts, security and peace; multilateral diplomacy; negotiation and conflict resolution; and current issues in international resolution.

**MSP4832 PUBLIC SAFETY AND RULE OF LAW**

| | |
|---|---|
| **Course title:** | Public Safety and Rule of Law |
| **Code:** | MSP4832 |
| **NQF level:** | 8 |
| **Contact hours:** | 56 contact hours |
| **Credits:** | 16 |
| **Course Assessment:** | C A **50%** (Minimum of 2 tests and 1 assignment) Final Examinations **50%** 1 x 3-hour paper |
| **Prerequisites:** | None |

**Course Description:** overview of the concept of crime, public safety, law and order; political control; oversight and accountability of policing; approaches to public safety; oversight and reform of the justice system.

## D.8. MASTER OF ARTS IN SECURITY AND STRATEGIC STUDIES

### *D.8.1. ADMISSION REQUIREMENTS*

Students may be admitted to this programme if they meet the General Admission Requirements of the University of Namibia and comply with additional requirements below:

- A student must have a good Bachelor Honours degree with at least a C-grade average, from the University of Namibia or equivalent.
- A student must have a good Postgraduate Diploma in Security and Strategic Studies from the University of Namibia or a comparable level 8 diploma.

A prospective student may be interviewed and assessed before recommending his/her application to the relevant UNAM structures.

### *D.8.2. MODE OF DELIVERY*

The MA in Security and Strategic Studies is offered on a block release basis.

### *D.8.3. DURATION OF STUDY*

The MA in Security and Strategic Studies programme should be completed within two (2) years. A one (1) year extension beyond the specified two years can be granted by the University on the recommendation of the School of Military Science and with the consent of the supervisor/s involved.

### *D.8.4. ASSESSMENT CRITERIA*

A combination of continuous assessment (50%) and an examination (50%) will be used to assess each of the typical courses in this programme. Continuous assessment will consist of a subset of the following, depending on the course needs: class tests, project, research and assignments.
A student registered for a course work programme shall write an examination at the end of each course. To qualify for admission to the examination a student must obtain a minimum Continuous Assessment (CA) mark of 40.

### *D.8.5. MAXIMUM NUMBER OF COURSES PER YEAR*

Seven courses in Year 1 and three courses and a thesis in Year 2.

### *D.8.6. ADVANCEMENT AND PROGRESSION RULES*

All First Year courses must be passed before proceeding to the Thesis component.

### *D.8.7. COURSES: CODES, RESTRICTIONS, EQUIVALENTS AND CONTENTS*

**QUALIFICATION: MASTER OF ARTS IN SECURITY AND STRATEGIC STUDIES**

**YEAR 1**

| Course Code | Course Title | NQF Level | NQF Credits | (Co-requisite) / Pre-requisite |
|---|---|---|---|---|
| UAE 5819 | Academic Writing for Postgraduate Students | 8 | NCB | None |
| MSS 5911 | The State & Human Security | 9 | 24 | None |
| MSS 5931 | The Study of Contemporary World Politics | 9 | 24 | None |
| MSS 5951 | Strategic Management | 9 | 24 | None |
| | **Total Credits Semester 1** | | **72** | |
| **Year 1 Semester 2** | | | | |
| PAR 5962 | Research Methodology | 9 | 12 | None |
| MSS 5912 | Comparative Foreign Policy | 9 | 24 | None |
| MSS 5932 | National Security and Development | 9 | 24 | None |
| | **Total credits Semester 2** | | **60** | |
| | **TOTAL CREDITS YEAR 1** | | **132** | |

**YEAR 2**

| | | | | |
|---|---|---|---|---|
| MSS 5971 | Intelligence Strategy | 9 | 24 | None |
| MSE 5911 | Elements of National Power | 9 | 24 | None |
| MSS 5981 | Research Paper | 9 | 18 | |
| | **Total credits Semester 1** | | 66 | |
| MSS 5992 | Thesis | 9 | 60 | PAR 5962 |
| | **Total credits semester 2** | | **60** | |
| | **Total credits Year 2** | | **126** | |
| | **TOTAL CREDITS FOR THE PROGRAMME** | | **258** | |

## D.9. MASTER OF ARTS IN SECURITY AND STRATEGIC STUDIES CURRICULUM COURSE DESCRIPTIONS

**FIRST YEAR**

| **MSS5911 THE STATE AND HUMAN SECURITY** | |
|---|---|
| **Course title:** | THE STATE AND HUMAN SECURITY |
| **Code:** | MSS5911 |
| **NQF level:** | 9 |
| **Contact hours:** | 18 hours per week for 3 weeks |
| **Credits:** | 24 |
| **Course Assessment:** | C A **50%** (a minimum of 2 evaluations (essays, syndicate work and/or written test)<br>Final Examinations **50%** 1 x 3-hour paper |
| **Prerequisites:** | None |

**Course Description:** The module explores the genesis and development of human security as a social construct; explores the nexus between state and human security, inclusive of the widening of the construct of security and a range of security referents,( such as public safety and security, gender and security, cyber security and maritime safety and security); offers an exploration of the policy templates that would enhance both state and human security, with an emphasis on the nexus between human security and human development; identifies and analyses human security fractures culled from southern Africa and elsewhere; engages theories of conflict at the micro-, meso- and macro levels of society.

| **MSS5931** | **THE STUDY OF CONTEMPORARY WORLD POLITICS** |
|---|---|
| **Course title:** | THE STUDY OF CONTEMPORARY WORLD POLITICS |
| **Code:** | MSS5931 |
| **NQF level:** | 9 |
| **Contact hours:** | 18 hours per week for 3 weeks |
| **Credits:** | 24 |
| **Course Assessment:** | C A **50%** (a minimum of 2 evaluations (essays, syndicate work and/or written test)<br>Final Examinations **50%** 1 x 3-hour paper |
| **Prerequisites:** | None |

**Course Description:** This course aims at analyzing and provides a critical disposition of competing theories and practices of contemporary world politics, globalisation, conflict and security in the international system. It also critically discusses and evaluates contemporary issues in world politics. Case studies relevant to understanding of contemporary global security challenges are also explored.

| **MSS5951** | **STRATEGIC MANAGEMENT** |
|---|---|
| **Course title:** | STRATEGIC MANAGEMENT |
| **Code:** | MSS5951 |
| **NQF level:** | 9 |
| **Contact hours:** | 18 hours per week for 3 weeks |
| **Credits:** | 24 |
| **Course Assessment:** | C A **50%** (a minimum of 2 evaluations (essays, syndicate work and/or written test))<br>Final Examinations **50%** 1 x 3-hour paper |
| **Prerequisites:** | None |

**Course Description:** This module is designed to inculcate in students the best approaches to achieve a competitive advantage and assurance of a long term success in managing security institutions. Topics covered by this module include strategic management overview, strategic planning approaches fundamental to national security policy formulation, military and defence planning, strategy formulation, alternative approaches to strategy formulation albeit control issues, environmental scanning and scenario planning, strategy implementation and evaluation, and strategy alignment with the structure, control and reward system.

**YEAR 1**

**SEMESTER 2**

| **PAR5962** | **RESEARCH METHODOLOGY** |
|---|---|
| **Course title:** | RESEARCH METHODOLOGY |
| **Code:** | PAR5962 |
| **NQF level:** | 9 |
| **Contact hours:** | 2 hours per week for two semesters |
| **Credits:** | 24 |
| **Course Assessment:** | Continuous Assessment **50%** (a minimum of 5 assignments and 2 evaluations (essays, syndicate work and/or written test) Final Examinations **50%** 1 x 3-hour paper |
| **Prerequisites:** | None |

**Course Description:** This course addresses the fundamentals of research on social issues within the context of national development. It seeks to inculcate appropriate skills and knowledge thereby empowering the students to design and undertake research using expertise gained for the good of the society. Students will be exposed to both quantitative and qualitative research methods and designs, the rigors of data collection and analysis, and the use of APA referencing techniques so that they can effectively apply the newly acquired skills when writing research proposals, dissertations/theses, and professional articles and books after graduating from the University of Namibia.

**MSS5912 COMPARATIVE FOREIGN POLICY**

| | |
|---|---|
| **Course title:** | COMPARATIVE FOREIGN POLICY |
| **Code:** | MSS5912 |
| **NQF level:** | 9 |
| **Contact hours:** | 18 hours per week for 3 weeks |
| **Credits:** | 24 |
| **Course Assessment:** | C A **50%** (a minimum of 2 evaluations (essays, syndicate work and/or written test and a research paper) Final Examinations **50%** 1 x 3-hour paper |
| **Prerequisites:** | None |

**Course Description:** To understand the foreign policy postures of different states, this course first takes a look at various approaches to the analysis of foreign policy. Frameworks are discussed on four levels of analysis: the international system, the state system, within- states, and the national/domestic context of foreign policy. Case studies will be extensively mined to examine processes of foreign-policy making and the implications of such policies in a variety of contexts; southern Africa (SADC) the African Union (AU), the big powers, middle powers, BRICS and small states.

**MSS5932 NATIONAL SECURITY AND DEVELOPMENT**

| | |
|---|---|
| **Course title:** | NATIONAL SECURITY AND DEVELOPMENT |
| **Code:** | MSS5932 |
| **NQF level:** | 9 |
| **Contact hours:** | 18 hours per week for 3 weeks |
| **Credits:** | 24 |
| **Course Assessment:** | C A **50%** (a minimum of 2 evaluations (essays, syndicate work and/or written test and a research paper)) Final |

**Course Description:** Theoretical approaches to security: concept of security, typology of security, security regimes, security communities, changing security in a changing world, oversight of the security sector. Elements of national security: military, political, economic, environment and security of energy and natural resources. Collective security: studies in Africa security co-operation, security co-operation, peace and security architecture of the African Union, ethnicity, ethnic conflict and security in Africa. National security threats: terrorism, espionage, proliferation, economic espionage, targeting national information infrastructure, targeting government, foreign intelligence activities.

| **MSE5911** | **ELEMENTS OF NATIONAL POWER** |
|---|---|
| **Course title:** | ELEMENTS OF NATIONAL POWER |
| **Code:** | MSE5911 |
| **NQF level:** | 9 |
| **Contact hours:** | 18 hours per week for 3 weeks |
| **Credits:** | 24 |
| **Course Assessment:** | Continuous Assessment **50%** (a minimum of 2 evaluations (essays, syndicate work and/or written test and a research paper)) Final Examinations **50%** 1 x 3-hour paper |
| **Prerequisites:** | None |

**Course Description:** The course examines the theories of the elements of national power which include: social, political, military, economic, psychological, infrastructure and information systems. The key tenets of power such as geographic set up, natural resources as well as population are highlighted.

**Year 2**

**Semester 1**

| **MSS5971** | **INTELLIGENCE STRATEGY** |
|---|---|
| **Course title:** | INTELLIGENCE STRATEGY |
| **Code:** | MSS5971 |
| **NQF level:** | 9 |
| **Contact hours:** | 18 hours per week for 3 weeks |
| **Credits:** | 24 |
| **Course Assessment:** | Continuous Assessment **50%** (a minimum of 2 evaluations (essays, syndicate work and/or written test and a research paper)) Final Examinations **50%** 1 x 3-hour paper |
| **Prerequisites:** | None |

**Course Description:** The course delves on the nature, theories and concepts of intelligence strategy, it examines legal basis, the formulating intelligence policy as well as all other intelligence strategic formulation processes. It deals with the collection, processing, analysis and dissemination of information. Issues involving the intelligence communities, government, military, national/international agencies, law enforcement and business are analyzed and interrogated. Various sources of intelligence such as media, web-based communities and public data will be examined. The course explores the all possible intelligence challenges.

| MSS5981 | RESEARCH PAPER |
|---|---|
| **Course title:** | RESEARCH PAPER |
| **Code:** | MSS5981 |
| **NQF level:** | 9 |
| **Contact hours:** | 12 hours per week for 3 weeks |
| **Credits:** | 18 |
| **Course Assessment:** | **100%:** 2 assignments and a research paper. |
| **Prerequisites:** | None |

**Course Description:** A Research Paper entails gathering appropriate and adequate information needed for conducting a research on a specific topic. The work should clearly indicate mastery of data collection techniques and demonstrate conversance with strategies to overcome or circumvent various challenges associated with data gathering and its interpretation.

| MSS5992 | THESIS |
|---|---|
| **Course title:** | THESIS |
| **Code:** | MSS5992 |
| **NQF level:** | 9 |
| **Contact hours:** | Regular contact with supervisors |
| **Credits:** | 18 |
| **Course Assessment:** | The candidate must ensure that he/she writes the thesis following UNAM's rules and regulations that govern thesis writing, and that the supervisor(s) must be satisfied with the work. The final copy of the thesis must be examined by one external examiner and an internal examiner. |
| **Prerequisites:** | None |

**Course Description:** Students who successfully complete the taught courses shall undertake research on a relevant topic in security related fields, approved by the supervisors and the Department of Political and Administrative studies. Before embarking on writing a thesis a student should first submit a research proposal that must be approved at all required University levels. A student can only officially register for a thesis after acceptance of his/her research proposal by the Post Graduate Studies Committee.

## E. PART-TIME COURSE/DISTANCE EDUCATION

The Faculty of Science does not offer a part-time curriculum. Some courses may be offered in the evening due to the time - table division. Prospective students should contact the Faculty Officer/Head of Department for further information. Part-time studies see Faculty Prospectus: Centre for External studies.

## F. GENERAL INFORMATION

All general information as well as the general examination dates and the dates for registration appear in the General Information and Regulations Prospectus.

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# Prospectus 2022