



NATIONAL CERTIFICATE IN WELDING AND FABRICATION (NCWF)



SYLLABUS
FOR
TECHNICAL AND VOCATIONAL INSTITUTES



THE REPUBLIC OF UGANDA
Ministry of Education Science Technology and Sports

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Ms Grace K Baguma

Director

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Foreword

Improvement of the curricula for Technical Certificate Courses is part of the Ministry of Education Science Technology and Sports' (MoESTS) strategy (2008), for the provision of technical and vocational education. Technical and Vocational Institutes, are the institutions training technicians in the country among others. The Government of Uganda aims at providing technical, scientific and vocational skills for a majority of Ugandans in line with its emphasis on the BTVET strategic plan of "Skilling Uganda".

The development of this curriculum started with a survey of the world of work, which included employers and graduates of technical certificate courses. A report from the survey culminated into the development of a Professional Profile, which includes all jobs and tasks that the graduates of Welding and Fabrication perform. This led to the development of all modules in this curriculum.

This curriculum is updated with current labour market demands and it is learner-centred and competence-based. It focuses on core tasks and assignments. It begins with a preparatory assignment and each academic year involves execution of a real life project that makes the technician competent in the trade. It aims at making Technical and Vocational Institutions the centre of excellence for technical education and skills development in the region, which will result into greater development and industrialisation of the country.

Dr. Rose Nassali Lukwago

Permanent Secretary

Ministry of Education Science Technology and Sports

List of Acronyms

ABC	Abstain, Be faithful, Use Condoms
BCC	Behaviour Change and Communication
BTVET	Business Technical Vocational Education and Training.
CD	Curriculum Development
CGPA	Cumulative Grade Point Average
CH	Contact Hours
CTF	Curriculum Task Force
CU	Credit Units
DES	Directorate of Education Standards
DIT	Directorate of Industrial Training
ELTE	Electronic Learning and Teaching Environment
GP	Grade Point
HCF/M	Highest common Factor/Multiple
HCT	HIV Counselling and Testing
HDME	Higher Diploma in Mechanical Engineering
HIV/AIDS	Human Immune Deficiency Virus/ Acquire Immune Deficiency Syndrome
KES	Kyambogo Engineering Service
LCM	Lowest common Multiple
MoESTS	Ministry of Education Science Technology and Sports
MoH	Ministry of Health
MoLGSD	Ministry of Labour Gender and Social Development
NCDC	National Curriculum Development Centre
NCHE	National Council for Higher Education
NDME	National Diploma in civil Engineering
NGO	Non-Governmental Organisation
NP	Normal Progress
NVQF	National Vocational Qualification Framework
NWY	Number of Weeks per Year
PEP	Post Exposure Prophylaxis
PH	Practical Hours
PLHIV	People Living with HIV and AIDS
PP	Probationary Progress
PPDA	Public Procurement and Disposal of Assets Act
RTI	Research Triangle International
SACCO	Savings and Credit Co-operative
HSE	Health Safety and Environment
SJA	Safe Job Analysis
SMC	Safe Male Circumcision

SPEAR	Supporting Public Sector Workplace to Expand Actions and Responses to HIV/AIDS
STI's	Sexually Transmitted Infections
TC	Technical Certificate; module code letter identifiers for Certificate courses
TCCA	Technical Certificate course module code for Computer Applications Skills
TCBE	Technical Certificate course module code for Business Entrepreneurship
TCCS	Technical Certificate course module code for Life Education
TCHY	Total Contact Hours per Year
TCMF	Technical Certificate Course module code for Machining and Fitting core modules
TCTM	Technical Certificate course module code for Applied Technician Mathematics
TCWF	Technical Certificate course module code for Welding and Fabrication core modules
TH	Training Hours
TI	Technical Institute
TS	Technical School
UBTEB	Uganda Business and Technical Examinations Board
UNAIDS	The Joint United Nations Course on HIV and AIDS
UNEB	Uganda National Examinations Board
UTC	Uganda Technical College
VAT	Value Added Tax
VTI	Vocational Training Institute
VS	Vocational School
WoW	World of Work

Introduction

This National Certificate in Welding and Fabrication curriculum is aimed at producing welders and fabricators who are relevant to the industry and world of work. It is learner-centred and competence-based with emphasis on practical teaching, projects and acquisition of skills by the learners.

The curriculum emanated from the BTVET act (2008), the strategic plan of “skilling Uganda” and Uganda Vision 2040.

The competences that the learners are expected to acquire are clearly spelt out in each module covered in each of the three terms of an academic year. The modules offered in this course are packaged in a manner that will enable the learner to attain particular skills required for performing tasks at any level of the respective academic year of study.

Modules such as Computer Applications, Basic Kiswahili and Life Skills, are aimed at enhancing the learner’s report writing, communication and presentation skills.

In addition, the following modules: Welding Technology and Practice, Workshop Technology and Practice, Foundry Practice, Drawing and Real Life Project, are aimed at equipping the learner with the core hands-on skills and techniques in the field of Welding and fabrication.

Applied Technician’s Mathematics module is aimed at improving the learner’s ability to; judge, make decisions, estimate and cost materials and labour, analyse data and understand trends in the world of work.

Entrepreneurship skills module provides the learner with the skills of starting up, managing and sustaining an enterprise in an ethical manner

Industrial training, which comes at the end of each academic year, is aimed at bridging the gap between institution-based training and world of work.

This curriculum, if implemented effectively, should produce welders and fabricators who are able to:

- i) ensure safety of workers and plant
- ii) weld components
- iii) fabricate components
- iv) carry out foundry works
- v) maintain workshop tools and equipment
- vi) supervise and inspect works
- vii) initiate and manage small business enterprises

Guidelines for Implementing the NCWF Curriculum

Title of course

The title of the course is National Certificate in Welding and Fabrication (**NCWF**).

Duration of the course

The National Certificate in Welding and Fabrication is a full time course taught in **two** academic years.

Each academic year consists of **three** terms. Terms one and two consist of **twelve (12)** weeks, which comprise of **ten (10)** weeks of teaching and continuous assessment and **two (2)** weeks of practical and written examinations. Third term consists of **ten (10)** weeks which comprise of **eight (8)** weeks of teaching and continuous assessment and **two (2)** weeks of practical and written examinations.

Industrial training is a core module carried out at the end of the academic year and lasts for **at least 6** weeks.

The course shall be completed within a time frame of **five** years from the time of enrolment and registration

Entry requirements

A candidate shall be eligible for admission to the National certificate in Welding and Fabrication course on meeting any of the following minimum qualifications:

a) Ordinary Level Entry Scheme (Uganda Certificate of Education)

The candidate should be a holder of Uganda Certificate of Education without restrictions on passes and the year of sitting **OR** its equivalent.

b) Certificate Entry Scheme

One should be a holder of Uganda Junior Technical Certificate (UJTC), Community Polytechnic Certificate OR National Junior Vocational Certificate from a recognised institution **OR** its equivalent in technical / vocational education.

Prospects for National Certificate in Welding and Fabrication

NCWF graduates may opt to further their skills and education by offering a Diploma and eventually a degree in any of the following areas:

- i) National Diploma in Mechanical Engineering

- ii) National Diploma in Automotive Engineering
- iii) National Diploma in Refrigeration and Air Conditioning
- iv) National Diploma in Information and Communication Technology
- v) Diploma in Agricultural Mechanisation
- vi) National Diploma in Architecture

Awards

- A learner completes the course with at least 2.0 Cumulative Grade Point Average (CGPA) in all the modules of the course shall be awarded a **classified “National Certificate in Welding and Fabrication”** by the mandated examining body.
- A learner who completes the course and does not attain at-least 2.0 GPA in some modules shall be awarded a **competency class Certificate in “ Welding and Fabrication”** by mandated examining body. “The competency class Certificate” shall allow specialised upgrading and employment since the learner attained some useful competences and skills required in a specialised field and the world of work.
- A candidate shall be considered to have acquired a competence on performing tasks required in the labour market. One must have attended **at least 75%** of the course and undergone both continuous assessment and end of year academic examinations.
- Continuous assessment shall be handled by training institutions and verified by the mandated examining body.
- On completion of year one, a learner is entitled to a statement of results by the mandated examining body indicating the grades obtained in each module irrespective of the performance.

Course Assessment

Coursework and Examination

The mandated National examining Body will assess the NCWF; and the following guidelines shall apply:

i) Real Life Project

The Real life project shall be assessed out of 100%. It shall consist of continuous assessment marks only awarded to learners during every practical session by the teacher. The real life project shall be executed on practicum sites which may be within or outside the institution, at the institutional workshop, garages, and industries or in any other suitable location.

The real life assessment shall be based on both the final product and the process involved in making it.

The mandated Examinations Board shall only verify the authenticity of the awarded marks from the completed projects on the ground and learners' participation through presentations.

The total duration of the project(s) assessment shall be **28 weeks** of teaching and continuous assessment in an academic year.

Real life project shall be assessed out of 100 marks as follows:

- | | |
|--|----------|
| • Design | 20 marks |
| • Drawing | 10 marks |
| • Bills of quantities | 10 marks |
| • Actual Implementation | 25 marks |
| • Finishing and branding | 20 marks |
| • Final report on project and Presentation | 15 marks |

TOTAL	100 marks
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ii) Other modules apart from real life project will be assessed out of 100 marks as follows:

- | | |
|-------------------------|-----|
| • Continuous Assessment | 40% |
| • Final Examination | 60% |

Continuous assessment shall consist of:

- Laboratory/practical work
- Tests
- Assignments consist of:
 - Class work
 - Written questions to be answered from home
 - Reports from attended industrial visits, Field visits, documentaries, and presentations by professionals
 - Practical execution and participation

Modules without practical work such as; Applied Technician Mathematics I (TCTM 101) and Applied Technician Mathematics II (TCTM 201), will have continuous assessment as follows; these

- | | |
|---------------|----------------------------------|
| • Assignments | 25 marks (home work /class work) |
| • Tests | 15 marks |
| Total | 40 marks |

Modules with practical work such as; Life Skills (TCCS 101), Basic Kiswahili (TCCS 201), Computer Applications (TCCA 101), Entrepreneurship Skills (TCBE 201), Welding Practice I (TCWF 101), Welding Practice II (TCWF 201), Fabrication Practice I (NCWF 102), Fabrication Practice II (NCWF 202), Materials (TCWF 103), Technical Drawing (TCWF 104) and CAD Drawing (NCWF 204) will have continuous assessment as follows:

- | | |
|------------------|----------|
| • Assignments | 10 marks |
| • Tests | 05 marks |
| • Practical work | 25 marks |

For continuous assessment, a learner shall undertake a minimum of **four (4)** assignments, **two (2)** tests and **four (4)** practical exercises per module.

Final Examination

Depending on the respective examinations paper format for each module, the questioning techniques to be applied should seek for the candidate's ability to remember, comprehend, apply, analyse, synthesise and evaluate conditions. All questions should be guiding the learner to perform the tasks expected of him/her in the world of work.

Industrial training

All institutional administrators, instructors/teachers and learners should endeavor to identify placements for industrial training. A placement in this case is any place where technology, hands on skills and knowledge are being applied to produce items or provide services. This may include a workshop, a construction site, small or large manufacturing enterprises, a corporate organization, a shop, a supermarket, a media house, a hotel, a lodge, a restaurant, a salon, a hospital etc.

The Industrial training assessment shall be conducted as follows:

- An industrial supervisor shall award 50% of the marks. This is because he/she is in contact with the learner and gives all the necessary practical teaching, support, guidance, correction, instruction and observation.
- An academic supervisor shall visit the industry on appointment and award 30% of the marks.

- iii. A written industrial training report shall be marked out of 20% and added to the industrial and academic supervisors' marks to make 100%.

The industrial training assessment forms for both industrial and academic supervisors are attached in the appendices II and III.

The mandated examinations body shall also verify the authenticity of the industrial training awarded marks at the industry during the training period by sending their representatives to visit the industries where learners are placed.

Weighting System

- i) The instruction methods of a module involve classroom teaching, field visits, laboratory testing, tutorials, and practical work. Each module is weighted using the credit unit (CU). One credit unit is equivalent to 28 contact hours (CH) per academic year.
- ii) A contact hour can either be a teaching or classroom-teaching hour (LH), tutorial hour (TH), field visit hour (FVH) and/or practical hour (PH). A contact hour is equivalent to 1 classroom teaching hour, 2 tutorial hours or 2 practical hours/field visits.
- iii) Modules are weighted according to the number of CUs they carry, which are based on their core relevancy in the trade of specialisation. Hence a module weighted 2 CU would take 30 contact hours; 3 CU would take 45 contact hours and so on. A module shall contain a minimum of 2 CUs and a maximum of 5 CUs.

Grading

Each module shall be graded out of 100%, according to the computed marks obtained from both the coursework and written examinations. The grade of a certificate awarded shall be based on the Cumulative Grade Point Average (CGPA) score. The final marks for a module shall be converted into Grade Point (GP) as follows:

Percentage mark range	Grade	Grade Point (GP)
80 – 100	A	5.0
75 – 79.9	B +	4.5
70 – 74.9	B	4.0
65 – 69.9	B –	3.5
60 – 64.9	C +	3.0
55 – 59.9	C	2.5
50 – 54.9	C –	2.0
45 – 49.9	D +	1.5
40 – 44.9	D	1.0

25 – 39.9	D –	0.5
00- 24.9	E	0.0

Calculation of Cumulative Grade Point Average (CGPA)

The CGPA shall be obtained by:

- i) Multiplying the grade point (GP) obtained by the credit units assigned to the module to arrive at the weighted score for the module.
- ii) Adding together the weighted scores for all modules taken up to the time.
- iii) Dividing the total weighted score by the total number of credit units taken up to the time.

Classification

The National Certificate in Welding and Fabrication shall be classified according to the CGPA obtained up to the end of the course as follows:

Class	CGPA
First class	4.40 – 5.00
Second class Upper Division	3.60 – 4.39
Second class Lower Division	2.80 – 3.59
Third Class	2.00 – 2.79
Competency Certificate	2.00 – 5.00 (When a learner scores less than 2.0 Grade Points (GP) in some modules, even after three attempts of retaking or has not registered for particular modules)

Retake a Module

- i) A learner may retake a module to improve grades. Retaking means repeating the entire module that is; attend lectures, doing continuous assessments and the final examination of that module. There will be no special examinations or tests. Should this learner get a lower grade during the retake, his/her original grade should prevail.
- ii) A learner should be allowed a maximum of three retakes for module.
- iii) Whenever a module is retaken, the academic transcript should **not** indicate so.

Dead Year

A learner is allowed to apply for a dead year of study due to financial difficulties, sickness or other disasters and should be allowed to resume the course at the level she/she exited for the dead year. All learners applying for the dead year shall also have to complete the course within a duration of five years from the time of enrolment and registration into the course.

Academic year Load

A learner shall carry a maximum of **30** credit units per academic year of study.

Maximum Modules per Academic Year of Study

Each academic year shall contain a maximum of **Eight** Modules including project work.

Final Examinations Paper Format

Year 1

Paper Name and Code	Examination Format
Applied Technician Mathematics I TCTM 101 Life Skills TCCS 101 Materials TCWF 102	Each paper shall consist of eight questions and the candidate will be required to answer any five . All questions shall carry equal marks. The questioning techniques to be applied should seek for the candidate's ability to remember, comprehend, apply, analyse, synthesise and evaluate conditions. Duration shall be three hours.
Welding Technology and Practice I TCWF101	The paper shall consist of two sections A and B . Section A shall be Welding technology and will contain 8 Essay questions to test for related knowledge and the candidate will be required to answer any five . It shall be marked out of 100 and then computed to 40 marks . Each question shall carry equal marks. Section B shall be welding practice and will contain two compulsory practical questions. It shall carry 60 marks , testing; (i) Oxy-fuel gas welding, brazing/soldering competence of sheet metal work and tubing. (ii) Shielded metal arc welding of plates up to 6mm thickness. The total duration of section A shall be 3 hours and section B shall be 6 hours . For section B , the examination body will send an assessor to the institution to mark the process and products of the candidates' work.

	The questioning techniques to be applied should seek for the candidates' ability to remember, comprehend, apply, analyze, synthesize and evaluate conditions. The questions should be commensurate with the available time and level of the candidates.
Technical Drawing TCWF 103	The paper shall consist of six questions and the candidate will be required to answer any four. All questions shall carry equal marks. The questioning techniques to be applied should seek for the candidates' ability to remember, comprehend, apply, analyze, synthesize and evaluate conditions. Duration shall be three hours.
Computer Applications TCCA 101	The paper shall consist of three practical questions carrying 50 marks each. A candidate will be required to answer any two. A print out of the practical outputs together with the softcopies of all files used will be sent to the assessing body. The questioning techniques to be applied should seek for the candidate's ability to, comprehend, apply, analyze, synthesize and evaluate conditions. The duration of this examination shall be two hours.
Fabrication Practice I TCWF 104	The paper shall consist of one practical question to be marked out of 100. The assessing body shall send an assessing examiner to the institutional workshop to mark the candidates as they progress with tasks in stages until completion. The questioning techniques to be applied should seek for the candidates' ability to apply, analyze, synthesize and evaluate conditions. The duration of the practical examination shall be six hours
Real life project I TCWF 105	The real life project shall consist of continuous assessment marks. The examinations board shall verify the authenticity of the awarded marks from the completed projects on the ground and learners' participation through presentations. The tasks to be performed should seek for the candidates' ability to apply, analyze, synthesize and evaluate conditions. The duration of the examination shall be the period during the 28 weeks of teaching in an academic year of study.

Year 2

Paper Name and Code	Examination Format
Applied Technician Mathematics II TCTM 201 Entrepreneurship skills TCBE 201	Each paper shall consist of eight questions and the candidate shall be required to answer any five. All questions shall carry equal marks. The questioning techniques to be applied should seek for the candidates' ability to remember, comprehend, apply, analyse, synthesise and evaluate conditions. Duration shall be three hours.
CAD Drawing TCWF 204	The paper shall consist of three practical questions carrying 50 marks each. A candidate shall be required to answer any two questions. A print out of the practical outputs together with the softcopies of all files used will be sent to the assessing body. The questioning techniques to be applied should seek for the candidates' ability to remember, comprehend, apply, analyze, synthesize and evaluate conditions. The duration of this practical examination shall be two hours.
Welding Technology and Practice II TCWF 201	The paper shall consist of two sections A and B. Section A shall be Welding technology and will contain 8 essay questions to test for related knowledge and the candidate will be required to answer any five. It shall be marked out of 100 and then computed to 40 marks. Each question shall carry equal marks. Section B shall carry 60 marks, and will contain two compulsory practical questions testing; (i) Welding of plates ranging from 6mm up to 10mm thickness in different positions. 30 marks (ii) Pipe and tube welding. Either one process shall be applied or a combination of; Shielded Metal Arc Welding (SMAW) or Metal Active Gas (MAG) or Metal Inert Gas (MIG) or Tungsten Inert Gas (TIG) welding processes shall be applied. 40 marks (ii) Competences in material and weld inspection using at least three of the following methods; visual, magnetic particle, Liquid dye penetrant, air or water pressure test, fluorescent penetrant, root and face bend, and nick break tests. 30 marks Section B shall be marked out of 100 and then computed to carry 60 marks. Each question shall carry marks as indicated above.

	The total duration for section A shall be 3 hours and section B shall be 6 hours. For section B, the examination body will send an assessor to the institution to mark the process and products of the candidates' work. The questioning techniques to be applied should seek for the candidates' ability to apply, analyze, synthesize and evaluate conditions. The questions should be commensurate with the available time and level of the candidates.
Fabrication Practice II TCWF 202	The paper shall consist of one compulsory practical question to be marked out of 100. The examination body will send an assessor to the institution to mark the process and products of the candidates' work. The questioning techniques to be applied should seek for the candidates' ability to apply, analyze, synthesize and evaluate conditions. The duration of the practical examination shall be six hours.
Basic Kiswahili TCCS 201	The paper shall consist of two sections A (General Kiswahili) and B (Professional Kiswahili). Section A shall consist of five questions and a candidate shall be required to answer any three questions. Section B consists of three questions and a candidate shall be required to answer any two. All questions shall carry equal marks. . The questioning techniques to be applied should seek for the candidates' ability to apply, analyze, synthesize and evaluate conditions. The duration of the practical examination shall be three hours.
Real life project II TCWF 205	The paper shall consist of continuous assessment marks. The examinations board shall verify the authenticity of the awarded marks from the completed projects on the ground and learners' participation through presentations. The tasks to be performed should seek for the candidates' ability to apply, analyze, synthesize and evaluate conditions. The duration of the examination shall be the period during the 28 weeks of teaching in an academic year

Focus of Education

The focus of education for NCWF emphasises the following aspects of learning:

- i) competence-based.

- ii) real life practical assignments with supporting modules.
- iii) integrated education (knowledge, skills and positive attitude).
- iv) innovation and initiative (learning to solve problems that one has never encountered).
- v) upward mobility and concentric curriculum: first year gives a picture of the later years and the profession (intensification).
- vi) entrepreneurship and creativity oriented.
- vii) health, safety, security and environmental considerations.
- viii) sports, clubs and social interactions.
- ix) focus on the disabled, gender, marginalised groups and equity.
- x) sustainability, professional practice, general and specialised law.
- xi) modularised courses
- xii) life skills

Assignment (Individual/Group)

Assignments to be done by learners shall either be individual-based or in groups. These will include:

- i) real-life (individual/group practical) projects
- ii) laboratory testing of materials
- iii) workshop practical exercises such as fitting, machining, welding and fabrication
- iv) classroom exercises/tutorials and practical exercises
- v) communications: oral presentation, email, and report writing
- vi) take-home assignments to test knowledge and ability to research
- vii) examinations and tests to gauge individual acquisition of knowledge and skills
- viii) site and industrial visits as well as case studies
- ix) information and communication technology (ICT)

Role of Learners

The learner should:

- i) participate fully in class work and assignments
- ii) be resourceful in group and personal research
- iii) seek guidance
- iv) learn to communicate - oral presentation, report writing and development of personal interactive skills
- v) learn to solve problems they have never faced before (initiation and innovation)
- vi) participate in community-based real life projects
- vii) assess the performance of staff and relevancy of courses
- viii) serve as ambassadors of the institution to the world of work
- ix) learn to work independently and as part of a team
- x) keep time and manage oneself and other people effectively
- xi) participate in sports, social and guild activities
- xii) participate in environment, health, safety and security awareness as well as preservation of activities
- xiii) practice leadership roles

- xiv) learn practical and entrepreneurship skills to enable them start up projects on their own
- xv) maintain discipline outside the Institution

Role of Teaching Staff

The teaching staff should:

- i) prepare schemes of work and lesson plans
- ii) keep records of attendance, assessment and discipline
- iii) serve as teachers, lecturers, supervisors and coaches
- iv) serve as consultants/supervisors for learners' projects and assignments
- v) assess learners' performance
- vi) contribute to continuing innovation in education
- vii) counsel and guide learners on career and social issues that may affect their studies
- viii) arrange for and carry out industrial training placement and supervision
- ix) arrange industrial tours and site visits
- x) prepare learners for project work as well as assess and record learners' progress
- xi) guide learners in project design and writing
- xii) collaborate in interdisciplinary activities
- xiii) assess effectiveness of the courses
- xiv) be ethical and role models to the profession
- xv) carry out research, write papers or publish technical books
- xvi) constantly update themselves on the industry's developments and requirement standards

Role of Non-Teaching and Support Staff

These should:

- i) ensure clean, healthy and attractive working and learning environment for learners and teachers
- ii) ensure timely delivery of materials and services for effective learning
- iii) maintain ethical and moral conduct
- iv) offer guidance and counselling to learners
- v) manage resources
- vi) ensure security of learners and the institute and their/its property
- vii) be flexible and willing to carry out any other duties assigned to them by the supervisors

Role of Administrative Staff

The administrative staff should:

- i) keep custody of Institute property (inventories)
- ii) plan for smooth running of the Institution (mobilise funds and human resources)
- iii) ensure equity and gender equality
- iv) link the institute with government, world of work and other stakeholders
- v) support and facilitate learners' activities
- vi) carry out admission of learners
- vii) maintain and uphold the good image of the institution

- viii) ensure high academic standards of the institution
- ix) arrange for graduations and regular meetings of alumni
- x) maintain ethical and moral conduct
- xi) ensure a safe and conducive learning environment
- xii) provide learners with adequate materials
- xiii) allow and facilitate inter-institutional activities
- xiv) ensure co-curricular management and its implementation
- xv) appraise staff performance
- xvi) ensure security of learners and their property
- xvii) ensure discipline among staff and learners
- xviii) recommend for promotion or disciplinary action among staff
- xix) appraise other staff
- xx) provide regular support to teaching and learning process.

Effective Learning Environment

For successful implementation of NCWF, an effective learning environment must be provided, which includes:

- i) Adequate physical infrastructure such as class rooms, laboratories, workshops and libraries equipped with relevant teaching/learning resources.
- ii) Electronic learning and teaching environment (ELE) such as computers, projectors, printers, photocopiers and printers to support teaching and learning processes.
- iii) Materials such as models, audio–visual aids, books, manuals, journals and equipment that offer learners and teachers’ professional situations.
- iv) Adequate facilities to cater for administration and other logistical terms that adequately support the educational process.
- v) Medical facilities, proper hygiene and sanitation, proper working and studying environment, good feeding, welfare and security for the learners and staff.
- vi) Proper motivation and inspiration of staff and learners for them to commit to the certificate course.
- vii) Adequate arrangement seminars, workshops and exhibitions, as well as sites and industrial visits.
- viii) A platform for learners and staff to air out their views such as representation on governing councils.
- ix) Professional personnel to adequately maintain all facilities such as dormitories.

Co-Curricular Activities

Co-Curricular activities are part of the institution activities and they enhance the teaching/learning process. Therefore the institution should ensure that:

- i) there are adequate sports and recreational facilities.
- ii) there is an effective learners’ guild through which sports, recreational, religious and cultural activities are channelled and organised, and supported by the institution administration without discrimination.

Professional Profile

This section describes the professional profile of the National Certificate in Welding and Metal Fabrication

Job Titles and Tasks of NCWF

The main duties and tasks performed by graduates of the National Certificate in Welding and Metal Fabrication include the following:

Job Title	Duties / Tasks
Welder	• Operates and performs basic maintenance of equipment and tools • Performs welding in all positions • Performs repair welding • Sets and operates oxy-acetylene equipment • Cuts and welds metals using oxy-acetylene flames • Casts aluminium and brass components • Performs hand forging of components • Performs heat treatment of metals • Performs non-destructive and destructive tests on materials and welds • Maintains records of production • Ensures safety at work place • Inspects finished products • Estimates and costs jobs • Initiates and manages small business enterprises • Identifies materials • Interpret working drawings
Fabricator	• Initiates and manages small business enterprises • Supervises works • Estimates and costs jobs • Maintains equipment and tools • Manufactures components and products • Prepares and interprets mechanical engineering drawings • Fabricates sheet metal products • Manages workshop records • Tests materials used in welding • Leads subordinates • Prepares and tests welding procedures • Tests welders

	• Inspects and tests welds • Fabricates templates and jigs • Makes simple designs and working drawings
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Organisations that employ (NCWF) graduates

A graduate of (NCWF) can be employed in the following types of organizations:

1. Manufacturing / processing industries both in the private and public sector like railway, military engineering services/ boards, corporations, and hospitals.
2. Construction companies, transportation departments, telecommunications, public works department and rural development agencies.
3. Power generation, transmission and construction projects.
4. Oil and gas industries
5. Self-employment in manufacturing and service sectors.
6. Technicians in Technical institutions

Core Tasks for NCWF

The core tasks are characterized as follows

Core Task 1: Ensuring safety of workers and plant	
Results	• Safety of workers and plant
Working environment	• Industries, workshops and sites
Level of complexity	• Routine safety precautions
Performance indicators	• Number of accidents and breakdowns
Methods, equipment and facilities used in performing professional tasks	Methods: • Record taking of accidents • Training of workers • Monitoring and evaluating all activities on site. Facilities and Equipment: • Computers and stationery • Planning software • Tender documents • Fire fighting equipment • Safety gear, charts, notices, flyers

Core Task 2: Welding of components	
Result	• Components/product
Working environment	• Workshops, industries, sites, power plants
Level of complexity	• Welding of components/products
Performance indicators	• Client satisfaction • Compliance with safety standards • Realistic / affordable/ economic designs • Economic growth
Methods and equipment used in performing professional tasks	Methods: • Machining • Joining • Simple forming processes Equipment: • Measuring instruments • Calculators • Drawing equipment • Testing equipment • Welding equipment • Jigs and fixtures • Hand and Machine tools

Core Task 3: Fabrication of components/products	
Result	• Components/product
Working environment	• Workshops, industries, sites, power plants
Level of complexity	• Fabrication components/products
Performance indicators	• Client satisfaction • Compliance with safety standards

	• Realistic / affordable/ economic designs • Economic growth
Methods and equipment used in performing professional tasks	Methods: • Machining • Joining • Simple forming processes Equipment: • Measuring instruments • Calculators • Computers • Drawing equipment • Testing equipment • Welding equipment • Jigs and fixtures • Hand and Machine tools

Core Task 3: Foundry	
Result	• Components/product
Working environment	• Workshops, industries, sites, power plants
Level of complexity	• Casting, forging, and heat treatment components/products
Performance indicators	• Client satisfaction • Compliance with safety standards • Realistic / affordable/ economic designs • Economic growth
Methods and equipment used in performing professional tasks	Methods: • Machining • Joining • Pattern making, moulding, melting, and casting • Heating and forming • Heat treatment Equipment: • Furnace • Flasks • Sand casting ramming tools

Core Task 5: Maintenance of workshop equipment and tools	
Result	Workshop equipment and tools in good working conditions
Performance indicators	• Client, consultant and contractor satisfaction • Availability and reliability of equipment • Successful project execution
Methods, equipment and facilities used in performing professional tasks	Methods: • Break down, preventive, predictive, condition based. • Cost Equipment and facilities: • Information technology equipment • Books on Standard methods of measurement • Maintenance tool kit

Core Task 6: Supervision and inspection of works	
Results/outputs	• Completed products
working environment	• Industries, workshops, fabrication and construction sites
Level of complexity	• Daily, weekly, monthly and annually
Performance indicators	• Client Satisfaction • Successful project execution • Quality products
Methods, equipment and facilities used in performing professional tasks	Methods: • Walk about • Appraisal • Guiding • Directing Facilities and Equipment: • Computer and stationery • Planning soft ware • Working drawings • Appraisal forms • Surveillance cameras

Core Task 7: Initiation and management of small business enterprises	
Results/outputs	• Business ideas recorded • Business plan drafted • Work plan
working environment	• Industries, workshops, fabrication construction sites, and farms
Level of complexity	• Daily, weekly, monthly and annually
Performance indicators	• Satisfaction of all parties involved • Timely and correct decision made • Appropriate operation of plans
Methods, equipment and facilities used in performing professional tasks	Methods: • Scanning the environment • Copying from existing businesses • Creativity • Responding to the environmental needs Facilities and Equipment: • Computer and stationery • Adverts • Tender documents

COURSE STRUCTURE

Year 1 (All Modules are Core)		TCHY	NWY	CU
TCAM 101	Applied Technician Mathematics I	112	28	4
TCCS 101	Life Skills	56	28	2
TCCA 101	Computer Applications	112	28	4
TCWF 101	Welding Practice I	140	28	5
TCWF 102	Fabrication Practice I	140	28	5
TCWF 103	Materials	84	28	3
TCWF 104	Technical Drawing	84	28	3
TCWF 105	Real Life Project I	112	28	4
TOTAL PER YEAR		840		30
RECESS TERM				
TCME 111	INDUSTRIAL TRAINING	288	6	5

Year 2 (All Modules are Core)		TCHY	NWY	CU
TCTM 201	Applied Technician Mathematics II	112	28	4
TCBE 201	Entrepreneurship Skills	84	28	3
TCCS 201	Basic Kiswahili	56	28	2
TCWF 201	Welding Practice II	140	28	5
TCWF 202	Fabrication Practice II	140	28	5
TCWF 204	CAD Drawing	112	28	4
TCME 205	Real Life Project II	112	28	4
TOTAL PER YEAR		756		27
RECESS TERM				
TCME 111	INDUSTRIAL TRAINING	288	6	5

TCHY : Total Contact Hours per Year
 NWY : Number of Weeks per Year
 CU : Credit Units = (CHY / NWY)

Detailed Module Description of Year 1 Term 1

TCTM 101: Applied Technician Mathematics I	
Duration: 40 Hours	
Module Overview This module is aimed at helping the learners attain some mathematical skills to enable him/her carry out measurements and estimates, and give him/her the foundation knowledge required for upgrading. It introduces a learner to calculate the cost of materials, solve problems related to fractions, decimals, percentages, ratios and proportions, areas and volumes of different figures, apply the laws of indices and logarithms.	
Learning Outcome By the end of this module, the learner should be able to: • convert metric units and use them in costing of materials. • calculate the areas and volumes of various objects.	
Competences: The learner: • converts millimetres to metres, kilograms to Newton's and tones. • calculates numbers involving highest common factor (HCF) and lowest common multiple (LCM). • applies percentages in relation to material costing. • determines areas of irregular objects using Simpson, mid ordinate and trapezoidal rules. • interprets the drawings by taking scale rule measurements. • costs the bricks and cement using the areas of irregular figures(Simpson, mid ordinate rule and trapezoidal rule) • applies the laws of indices in solving indicial equations. • rationalises and manipulates indicial equations. • evaluates logarithms.	
Detailed Module Description	Duration
Sub-module 1: Basic S.I Units and Arithmetic Algebra • Metric conversion of S.I Units • Fractions (LCM and HCM) and decimals • Percentages, ratios and proportions	08 Hours
Sub-module 2: Mensuration • Calculation of area, perimeter, volume and total surface area for regular and irregular figures • Interpretation of given drawing/diagrams • Cost calculations • Areas of irregular figures [Simpson rule, mid ordinate rule, trapezoidal rule]	12 Hours
Sub-module 3: Indices and Logarithms • Laws of indices and standard form, fractional indices, negative indices	20 Hours

• Indicial equation • Multiplication and division of indices • Rationalization and equations involving indices • Rules of logarithms • Common logarithms, change of base • Equations involving logarithmic functions, exponential functions and logarithmic graphs • Natural logarithms	
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TCCS 101: Life Skills Duration: 20 Hours	
Module Overview The module equips learners with the skills applied in day to day transactions such as writing: application letters, CVs, minutes as well as skills in technical communication, note taking and basic knowledge on HIV and AIDS.	
Learning Outcomes By the end of the module, the learner should be able to: • communicate effectively in the field of work. • positively relate with the environment and prevent HIV and AIDS spread.	
Competences The learner: • listens and takes notes. • speaks, interacts and conducts meetings. • makes an agenda and conducts meetings. • refrains from communications which are against the standing orders of the firm. • talks and relates well with others at the workplace. • writes the personal curriculum vitae (CV), reports, memos, delegation letters, claim letters, circulars and demand notices • prepares a workshop paper for presentation. • writes suitable adverts and announcements • gives an account of the origin and history, prevalence rates and current trends of HIV/AIDS in Uganda. • outlines some HIV myths and misconceptions. • educates the public about the myths, misconceptions, facts and prevention of HIV/AIDS.	
Detailed Module Description	Duration
Sub-module 1: Introduction to Communication Skills • Fundamental skills: - reading, - listening - note taking and note making - speaking and interaction skills	6 Hours

• Conducting meetings and interviews • Interpersonal skills • Workplace communication	
Sub-module 2: Writing Skills ▪ Academic writing: - technical and scientific report writing - curriculum vitae and resume writing - authority and delegation letters - writing of circulars • Office and business writing: - intra and inter-office communication - business correspondence and memo writing - advert and announcement writing	10 Hours
Sub-module 3: Introduction to HIV and AIDS • Background of HIV and AIDS : meaning, definition, history, current trends and prevalence • Myths and misconception on HIV and AIDS • Basic facts about HIV and AIDS	4 Hours

TCCA 101: Computer Applications Duration: 40 Hours
Module Overview This module is designed to; equip learner with computer skills of typesetting reports and other documents, enable the learner to use internet for searching, carry out simple connections and installations of a computer and its accessories.
Learning Outcomes By the end of the module, the learner should be able to: • use and manipulate a computer to prepare documents • search web-based information from the internet.
Competences The learner: • identifies different types of computers and describes the application of computer hardware, CPU, hard disc drives, modems, mouse and external speakers. • removes and replaces computer components. • identifies and uses keyboard buttons as per their functions. • typesets data into the computer using the keyboard. • Opens, closes, restarts and changes user accounts computer. • describes computer operating system, types and its functions. • installs and uninstalls Windows operating system, application software and other support programmes. • locates the desktop start menu • creates desktop background and screen saver. • resizes, opens and closes windows by maximising and minimising to task pane. • copies files from external drive, CD, DVD and flash disc to the computer.

- identifies icons and their application. - starts, creates or opens a Word window, works with text and manages files. - uses word menus for document editing; e.g. copy, paste, cut. - saves a document in different formats and to a storage media, e.g. flash disc. - formats a page and documents.	
Detailed Module Description	Duration
Sub-module 1: Introduction to Computer - Origin of computer - Types of computers and computer hardware (CPU, hard disk drives, modem, keyboard, etc) - Computer Accessories; scanners, projectors, external speakers - Keyboard basics; function keys, numeric keys and navigation keys - Starting a computer, closing down the computer (BOOTING) - Computer Software; classification, types, usage and Computer components; (video card, network cards, cables, ROM, RAM, monitors, printers, cameras, processors) - Safety, Health and Security of a computer	10 Hours
Sub-module 2: Operating System - Functions of an operating system - Types and classification of operating system and benefits of operating systems - Installation of windows operating system and application software	6 Hours
Sub-module 3: Desktop Main Menu - Start menu - Applications menu - Working with the desktop; background, screen saver - Manipulating open windows; resizing, maximising, minimising, task pane, and tiling windows etc - Copying files from different locations - Icons, files and folders	4 Hours
Sub-module 4: Word Processing - Starting, creating and opening a word window - Working with text - Word menus for document editing; e.g. copy, paste, cut - Saving a word document - Saving a document in different formats and to a storage media, e.g. flash disc - Formatting a page and documents; paper size, background colours - Working with tables; rows and columns - Working with drawings, ClipArt and pictures - Mail merging	20 Hours

TCWF101:Welding Practice I**Duration: 50 Hours****Module Overview:**

The module introduces learners to the basics of First Aid, safe working practices, managing working environment, welding processes, arc welding technology and shielded metal arc welding (SMAW) practice -up to 6mm mild plate thickness.

Learning outcome:

By the end of this module, the learner should be able to select welding processes, operate shielded metal arc welding machines, weld mild steel plates - up to 6mm thickness, and safely manage the working environment.

Competences:

The learner

- Observes safety and health regulations during practice and performs good housekeeping
- Uses the right safety gear at work places
- Applies correct methods of handling welding materials, tools and equipment according to recommendations.
- Recognizes and Describes hazardous and non-hazardous materials at work places.
- Standardizes the work permit system.
- Identifies and applies the 5's system in SHE management
- Identifies possible causes of accidents in sites and workshops
- identifies potential risks at workplace
- Applies the SJA while working on his /her daily activities
- Handles and prevent contamination of toxic substances
- Explains the dangers of drug abuse and drug addiction
- Sensitizes others about the dangers of drug abuse and drug addiction
- Describes the importance of first aid
- Identifies and classifies injuries
- Describes the preventive measures and treatment given to specific injury
- Administers first aid
- Reports of first aid provided to the casualties
- Refers cases to the medical facilities
- Operates lifting tools and equipment safely
- Observes industrial hygiene
- Identifies and classifies wastes, Safely removes and disposes wastes
- Identifies occupational hazards and eliminates their causes
- Safely pickup and dispose hazardous materials
- Selects appropriate welding methods, process and consumables for a given task based on quality, availability, cost, and compatibility
- Differentiates welding methods, processes and consumables
- Identifies welding power sources and welding machines
- Uses different types of welding machines for a given job/material

• Connects and operates gas welding equipment and accessories • Identifies welding tools and equipment according to their groups and application • Describes the historical development of welding and the future of the industry • Selects the welding machine and suitable power source • Explains welding current and physics of welding • Identifies butt, fillet, lap, corner joints and Welds joints in flat and horizontal positions • Identifies consumable and non-consumable electrodes • Classifies surface and sub-surface welding defects	
Detailed Module Description	Duration
Sub-module 1: Safety, Health and Environment (HSE) for welders • Introduction to Health Safety and Environment (HSE) culture • Personal Protection Equipment PPE • Safety when handling welding materials • Welding equipment and tools safety • Hazard recognition • Work permit system • Introduction and implementation of 5S • Causes of accidents in work places • Assessment of potential risks • Application of safe job analysis (SJA)	10 hours
Sub-module 2: First Aid • Introduction to First Aid • Treatment of arc eye, burns/scalds • Electrical injuries • Shock • Body failures (heart, breathing, paralysis, epilepsy, convulsion, fainting) • Bleeding and wounds • Fractures	6 Hours
Sub-module 3: Safe working practices and environment • Lifting operations • Types of wastes • Hazardous waste pickup and disposal	4 Hours
Sub-module 4: Introduction to welding processes • Welding processes (Shielded metal arc welding, gas welding, resistance welding, metal arc gas welding, metal inert gas welding, tungsten inert gas welding, submerged arc)	4 hours
Sub-module 5: Welding machines and equipment • Power sources for arc welding (grid, generators, batteries) • Type of welding machines (transformer , rectifier, inverter, resistance, seam welding machines) • Gas welding equipment (manifold and mobile)	6 hours

Sub-module 6: Introduction to Arc welding technology and practice; shielded metal arc welding (SMAW) up to 6mm plate thickness • Historical development of welding and the future of the industry • The electric arc and arc development (current and physics of welding) • Arc welding electrodes (consumable and non-consumable) • Arc welding joints: butt, fillet, lap, corner • Introduction to arc welding defects: surface and sub-surface	20 hours
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TCWF 102: Fabrication Practice I Duration: 50 Hours
Module overview This module introduces learners to safety when using tools, devices, equipment, marking out, functions of basic tools, devices, equipment and machines in the workshop.
Learning outcome: By the end of this module, the learner should be able to identify, use, and maintain workshop devices, machines, accessories, tools and equipment.
Competences: The learner: • Observes personal and machine safety when performing work, lifting objects and when handling non-conformities. • Uses machines, tools and equipment following the recommended safe procedures and regulations • Maintains machines, tools and equipment in good and safe working conditions • Identifies, select s appropriately and uses striking, fixing, and forming tools • Uses striking, fixing, and forming tools. • Identifies and uses different measuring tools • Identifies, select s appropriately and uses gauges • Identifies, selects and uses machines and power tools • Identifies, selects appropriately and uses power tools • Identifies, selects and uses workshop devices, equipment and accessories • Operates and maintains some machines in the workshop • Identifies and selects marking out tools and equipment • Correctly uses marking out tools • Accurately transfers measurements to the work piece • Constructs templates accurately • explains the design process • sketches ideas to represent actual needs

- explains the concept of copying and reverse engineering - Identifies and selects forging tools and equipment - Use forging tools and equipment to bend, draw down, draw out, upset, punch, flatten, twist, cut, scroll, and perform swaging and fullering - Prepares a JSA for a before doing the job - Implement Safety practices in a gas welding workshop 5S	
Detailed Module Description	Duration
Sub-module 1: Workshop safety - Personal safety - Machine safety - Lifting operations - Handling of non-conformities	04 hours
Sub-module 2: Tools, devices, and equipment - Hand tools (Striking, fixing, cutting, forming) - Forging tools - Measuring tools (vernier callipers, rules, micro metre screw gauges, squares, tape measures) - Gauges (Spirit level, plumb bob, dial gauges) - Machine tools (Cutting, grinding, shearing, polishing, forming, fitting) - Power tools (Construction, use, maintenance) - Workshop devices, equipment and accessories (Surface plate, anvil, press, vice, clamps, saw, pedestal grinder,	12 hours
Sub-module 3: Marking out - Marking out tools and equipment ;(scribers, straight edges, punches, trammels dividers ,surface plates, surface gauges calculator, chord rule, chalk, prick punch, combination square , protractor ball peen hammer) - Templates	08 hours
Sub-module 4: Fabrication design - Introduction to design and the design process - Sketching - Interpretation of pictures, sketches and simple drawings - Copying and introduction to reverse engineering theory	10 hours
Sub-module 5: Black Smithing - General safety practices in a blacksmith shop - Occupational noise - Radiation - Forging processes (bending, drawing down, drawing out, upsetting, punching, fullering, flattening, swaging, twisting, cutting, and scrolling)	16 hours

TCWF103: Materials Duration: 30 hours	
Module overview The module introduces learners to common engineering materials used in welding and fabrication trade.	
learning outcome: By the end of this module, the learner should be able to - Identify and tests materials - Select and use suitable materials for fabrication Competences: The learner - Practices general safety when handling materials - Identifies different types of wastes - Practices safe hazardous waste pickup and disposal - Identifies different fabrication materials - Classifies engineering materials - Relates the properties of metals to their production processes - Correctly select s suitable materials for a given job - Describes the production and properties of iron - Identifies and classifies ferrous metals - Describes effects of alloying elements on ferrous metals - Describes microscopic structures of ferrous metals - Describes various applications of ferrous metals	
Detailed Module Description	Duration
Sub-module 1: Introduction to engineering materials - General safety practices when handling materials - Types of wastes - Hazardous waste pickup and disposal - Classification of materials - Properties of common engineering metals (Iron, Aluminium, Copper, Tin, Zinc, Tungsten, bearing metals, lead, magnesium-base alloys, copper-base alloys, wood, plastics, among others) - Factors affecting selection of materials	08 hours
Sub-module 2: Ferrous metals - Introduction to ferrous metals - Production of iron - Microscopic structures - Ferrous alloys - Iron carbon diagram - Introduction to forging of ferrous metals - Metal forming processes (bending, drawing down, drawing out, upsetting, punching, fullering, flattening, swaging, twisting, cutting, and scrolling)	06 Hours

Sub-module 3: Heat treatment • Safe handling of heat treatment tools and equipment • Introduction to heat treatment • Heat treatment safety precautions • Types of furnaces and fuels • Annealing • Quenching • Tempering • Hardening • Normalizing	08 Hours
Sub-module 4: Fabrication sections • Identification and selection of structural shapes and built-up sections (angles bars, T-sections, channels, I-sections, square tubes, round tubes, Z-sections, flat bars, square bars, round bars metal sheets and plates)	08 Hours

TCWF104:Technical Drawing I Duration: 30 hours	
Module overview The module equips learners with skills useful in engineering drawing and geometrical construction techniques	
learning outcome: By the end of the module, the learner should be able to identify, use and care for engineering drawing tools and equipment.	
Competences: The learner • Describes the importance of drawing as and engineering language • Describes and identifies drawing instruments • Sets drawing paper on drawing board • Draws lines and prints letters • Draws paper layouts • Describes and identifies types of engineering drawing lines • Constructs lines and angles of: $7\frac{1}{2}^{\circ}$, 15°, 30°, 45°, 60°, 90°, 110° • Constructs polygons and draws basic geometric shapes/solids • Draws tangents using geometrical construction techniques • Applies the principles of tangency to drawing problems • Draws in three dimension objects and models them into reality	
Detailed Module Description	Duration
Sub-module 1: Introduction to engineering drawing	

• Definition and aims of engineering drawing • The instruments and equipment used in drawing • Setting/ layout of drawing paper • Lines and lettering • Drawing lay-out (title block, scale, outline)	14 hours
Sub-module 2: Geometrical Construction • Construction of lines • Construction of angles; $7\frac{1}{2}^\circ$, 15°, 30°, 45°, 60°, 90°, 110° • Basic geometrical design • Principles of tangency • Construction of tangents and application • Constructions of polygons • Introduction to three-dimension drawing	16 hours

NCWF 105 Real life project I Duration: 40 hours	
Module Overview This module equips the learner with the practical skills in analysing design requirements, selection of materials of fabrication involving preparation and interpretation of drawings, forming/machining, joining, fitting, finishing and assembly of various engineering components.	
Learning Outcomes By the end of this module, the learner should be able to: • analyze design requirements, select materials for fabrication: • fabricate, draw, form/machine, join, fit, finish and assemble various engineering components.	
Competences The learner: • prepares safe job analysis (SJAs) for the project • prepares safety reports • prepares and interprets engineering drawings. • identifies materials/tools and machines. • innovates and modifies components. • carries out shaping operations: filing, sawing, casting, forming, machining, tapping and cutting threads using dies. • costs and quantifies materials. • assembles components. • tests components/machines. • prepares project reports.	
Detailed Project Description	Duration

SUGGESTED PROJECTS • Fabrication of waste management tools and equipment • Maintenance of workshop tools, machines and equipment • Design and fabrication of templates for mass production of simple objects • Fabrication of simple articles like; spanners, key holders, and bottle top openers.	40
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Detailed Module Description of Year 1 Term 2

TCTM 101: Applied Technician Mathematics I

Duration: 40 Hours

Module Overview

The module introduces the learner to trigonometry, matrices and their application in engineering. It equips the learner with knowledge and skills used in setting out structures and positioning of the technician's ladder/scaffolds to safer leaning angles.

Learning Outcome

By the end of this module, the learner should be able to apply trigonometry in determining the sizes, shapes of materials required and their related costs.

Competences

The learner:

- calculates for the sine, cosine and tangent of a right angled triangle.
- determines the ladder safe leaning angles and roof pitches.
- manipulates trigonometrically ratios of 30° , 45° , 60° and their application in finding the areas of plots of land and other surfaces.
- draws trigonometric graphs.
- determines the heights and other distances or sides of triangles, areas of roofs and walls using the sine, cosine and tangent formulae.
- adds and subtracts matrices.
- transposes matrices.
- calculates the determinants of matrices with linear equations.

Detailed Module Description

Duration

Sub-module 4: Trigonometry

26 hours

- The general angle
- Pythagoras theorem
- Graphs of trigonometrical functions
- Trigonometrical ratios of 30° , 45° , 60°
- The sine formula
- Cosine formula
- Tangent formula
- Half angle formula
- Heights and distances

Sub-module 5: Matrices

14 hours

- Addition and subtraction of matrices
- Multiplication and division of a square matrix
- Application, order and types
- Transpose and inverse of a square matrix
- Solution of sets of linear equations

TCCS 101: Life Skills	
Duration: 20 Hours	
Module Overview The module is intended to enable the learner improve on his/her discourse and writing skills; prepare and make presentations; educate the public on the spread and control measures of HIV and AIDS.	
Learning Outcomes By the end of the module, the learner should be able to: • logically make discourse writing. • prepare and make presentations. • change ones behaviour and protect self and others against HIV/AIDS.	
Competences The learner: • correctly writes definitions of terms and descriptions of events in a logical manner. • analyses the comparisons between two issues or objects and makes a correct decision. • narrates the order in which events happened and gives objective arguments. • prepares the seminar document and makes presentations. • prepares a classroom report and makes a presentation . • prepares a public document and presents it. • identifies and describes the modes of transmission of HIV/AIDS. • identifies the risk factors and change in the behaviour required. • manages risks and takes preventive measures. • educates public and peers on risk behaviour and their management. • demonstrates the best use of a condom.	
Detailed Module Description	Duration
Sub-module 4: Discourse Writing • Definition and descriptive writing • Comparison and contrast • Narration and arguments	10 Hours
Sub-module 5: Presentations • Seminar document preparation and presentation • Classroom report preparation and assessment presentations • Public document preparation and presentations	06 hours
Sub-module 6: Spread and Control Measures of HIV and AIDS • Modes of transmission • Risk factors • Prevention of HIV and AIDS • Behaviour change	04 Hours

TCCA 101: Computer Applications	
Duration: 40 Hours	
Module Overview This module is aimed at helping the learner carry out printing, scanning of documents and the use of the Internet for searching the required information.	
Learning Outcomes By the end of the module the learner should be able to: • prepare documents on spread sheets • use the internet to search for the required information.	
Competences: The learner: • installs the printer to a computer. • describes the procedure followed when printing documents. • removes used up cartridges , toners and replaces or refills them. • scans a document or pictures, saves and prints. • uses internet and e-mail to search for notes, news and other required information. • signs in and creates an e-mail address. • copies and saves information from the Internet, downloading files, music, pictures to the computer. • creates a strong password for the email address. • connects two computers in one room to a LAN and share one printer. • writes , sends receives and reads mail messages. • copies files and documents from one location to another. • emerges, deletes and inserts excel cells. • makes and formats the spread sheets . • prepares Bills of quantities and applies excel formulae in adding, multiplying, subtracting and dividing figures. • draws charts and Graphs using excel .	
Detailed Module Description	Duration
Sub-module 5: Printing, Scanning and Copying Documents • Printing documents • Working with printer cartridges and toners • Scanning documents and pictures • Copying • Safety, Security and Health precautions of Printing and Scanning gadgets	04 Hours
Sub-module 6: Internet and E-mail • The Internet, web browsers • Opening a website; website address (url) • Internet searching and search engines • Saving information from the Internet, downloading files, music, pictures to the computer • Electronic mail:	16 Hours

- creating email accounts - e-mail folders and attachments - attaching documents to outgoing email - downloading e-mail attachment from incoming email - formatting mail - searching mail - printing mail Security, Safety and Health practices when using the internet and email	
Sub-module 7: Working with Spreadsheets • Creating an excel document • Opening and closing excel document • Entering data to a worksheet, editing and formatting a datasheet • Using formulas and functions • Creating/plotting charts and graphs from excel data values • Inserting tables to excel worksheet • Printing a spreadsheet; page setup, gridlines	20 Hours

TCWF101: Welding Practice I Duration: 50 Hours
Module overview The module introduces learners to basics of gas welding technology and practice Learning outcome: By the end of this module, the learner should be able to operate gas welding equipment and carry out gas welding, brazing, soldering, and gas cutting. Competences: The learner • Describes the principles of gas welding engineering • Protects self, and environment from hazardous gases • Practices safety in a gas welding workshop • Safely handles gas welding equipment • Welds in different positions using oxy-acetylene gas welding process • Performs fusion and non-fusion welding • Identifies gas welding defects • Performs gas cutting and gouging • Perform metal spraying • Prepares work pieces for brazing, soldering and gas welding • Identifies fluxes used in brazing and metal spraying • Selects filler metals for brazing, soldering and gas welding • Assembles joints for dip brazing

• Chooses appropriate type of brazing and soldering • Performs brazing • Describes various soldering methods applied in industry • Identifies the soldering filler metals and fluxes used in soldering • Selects soldering filler metals • Chooses appropriate type of soldering for a given task • Applies soldering techniques on job • Identifies filler metals for non-ferrous metals • Identifies fluxes for non-ferrous metals • Selects appropriate welding, brazing, and soldering processes for welding aluminium • Selects appropriate welding, brazing, and soldering processes for welding copper and brass • Identifies defects in gas welding, brazing, and soldering	
Detailed Module Description	Duration
Sub-module 7: Gas welding engineering and practice • Hazardous gases • Safety practices in a gas welding workshop • Introduction to gas welding engineering • Production and storage of oxygen and acetylene gases • Gas fusion welding • Gas non fusion welding • Gas welding defects • Gas cutting and gouging • Metal spraying	16 Hours
Sub-module 8: Brazing • Introduction to brazing procedures • Fluxes and filler metals • Dip brazing, furnace brazing, induction brazing, infrared, resistance, torch brazing.	12 Hours
Sub-module 9: Soldering • Introduction to soldering procedures • Types of soldering (Dip soldering, furnace soldering, induction soldering, infrared soldering, iron soldering, resistance soldering, and torch soldering)	10 Hours
Sub-module 10: Gas welding, brazing, and soldering of non-ferrous metal • Welding of aluminium, • Welding of copper, • Welding of brass • Gas welding/brazing defects	12 Hours

TCWF102: Fabrication practice I Duration: 50 Hours	
Module overview The module equips learner with hands on skills of cutting, sawing, fitting and surface finishing. The skills attained in this module, shall be applied on day to day practical life of the learner, involving creativity and innovation.	
learning outcome: By the end of the module, the learner will be able to demonstrate acquired skills of cutting, sawing, fitting and surface finishing to fabricate components.	
Competences: The learner • Practice general safety when performing cutting, sawing, fitting and finishing work. • Selects and identifies hack saw blades for specific jobs • Cuts material following scribes lines/ dimensions using hacksaws • Chisels metal stock following scribed lines • Punches marked surfaces • Cuts plate using snips, hand shears and power • Securely Fixes work piece in the machine vice • Operates drilling machines to drill holes accurately and safely • Sharpens drill bits to correct angles • Identifies various types of threads • Performs thread calculations • Cuts threads using dies and taps • Prepares materials for joining • Identifies appropriate methods of joining metals. • Rolls and bends materials • Straightens and presses materials • Fits parts according to specifications • Joins materials using different methods • Applies the concept of Limits and Fits • Assembles and disassembles components • Classifies files • Files flat and curved surfaces • Grinds surfaces using angle and pedestal grinders • Identifies different grades of sanding paper • Sands surfaces to different grades of surface finishes • Identifies forming tools • Forms metal products using various forming tools and equipment • Identifies lapping and scraping tools • Performs lapping and scrapping	
Detailed Module Description	Duration
Sub-module 6: Cutting and sawing • General safety when performing cutting, sawing, fitting and	20 hours

finishing work. • Hack sawing • Chiselling • Punching • Shearing • Drilling • Thread cutting	
Sub-module 7: Fitting • Joining (Bolting, Riveting, bonding, welting) • Bending and rolling • Surface correction (straightening and pressing) • Interchangeability (Limits and Fits) • Assembly and disassembly of components	18hours
Sub-module 8: Surface finishing • Finishing of surfaces by; filing, grinding, sanding, forming, lapping and scrapping	12 hours

TCWF103: Materials Duration: 30 Hours
Module overview: The module introduces learners to the production processes, properties and weld-ability of ferrous and non-ferrous metals.
Learning outcome: By the end of this module, the learner should be able to identify, select and recommend appropriate welding process and uses of various ferrous and non-ferrous materials and follow welding procedures.
Competences: The learner: • Practice general safety considerations taken during production of metals • Identify toxic metals and describe safety precautions • describes the production process of aluminium, its additives and properties • describes the production of copper, magnesium, their additives and properties • describes production of cast iron, stainless steel, their additives and properties • identifies different types of stainless steels and their applications • describes the behaviour of aluminium, copper, magnesium, cast iron, stainless steel and their alloys during welding • takes caution when fabricating aluminium, copper, magnesium, cast iron, stainless steel and their alloys • describes and observes the conditions required for welding of aluminium, copper,

magnesium, cast iron, stainless steel and their alloys • selects appropriate welding processes for aluminium, copper, magnesium, cast iron, stainless steel and their alloys • follows procedures of welding aluminium copper, magnesium, cast iron, stainless steel and its alloys using several methods	
Detailed Module Description	Duration
Sub-module 5: Ferrous and non-ferrous metals • General safety considerations taken during production of metals • Toxic metals and safety considerations • Production of aluminium and its alloys • Production of copper and its alloys • Production of magnesium and its alloys • Production of cast iron • Production of stainless steel	14 hours
Sub-module 6: Weldability of ferrous and non-ferrous metals • Weldability of aluminium and its alloys • Weldability of copper and its alloys • Weldability of magnesium alloys • Weldability of cast iron • Weldability of stainless steel	16 hours

NCWF104: Technical Drawing I Duration:30 Hours
Module overview The module equips the learner with the skills required when presenting drawings in freehand sketches, orthographic, isometric and oblique projections.
Learning outcome: By the end of the module, the learner should be able to produce and interpret drawings in orthographic, isometric and oblique projections
Competences: The learner: • Interprets and draws objects in first and third angle projections. • Represents correctly and indicates the correct symbol for first and third angle projections. • Interprets and draws views of sectioned objects in 1st and 3rd angle projections • Applies projections to draw various shapes of objects • Applies the principles of isometric projection in design, interpretation and drawing of the required objects • Designs beds, chairs windows, pavers using the pictorial drawing applications.

• Develops ideas and makes freehand neat drawings to represent the perceived assertions • interprets and draws objects in 3-Dimensions representing the real life objects	
Detailed Module Description	Duration
Sub-module 3: Orthographic projections • Interpreting and drawing views of objects in 1st and 3rd angle projections. • Interpreting and draw views of sectioned objects in 1st and 3rd angle projections.	16hours
Sub-module 4: Drawing Isometric and Oblique Objects • Principles of isometric and oblique projections, construction of objects composed of isometric lines and isometric circles. • Pictorial drawings interpretation and drawing and 3D drawings • Freehand sketching and drawing and 3D drawings	14 hours

TCWF 105: Real life project I Duration: 40 hours
Module Overview This module equips the learner with the practical skills in fabrication of components using welding, forging, machining and bench work techniques. It also introduces the learner to materials science and welding metallurgy of metals.
Learning Outcomes By the end of this module, the learner should be able to plan and select materials appropriately and fabricate components to suit client's design needs
Competences The learner: • assesses risks and prepares safe job analyses (SJAs) for the project • prepares safety reports • Interprets drawings • Designs objects/components by drawing and sketching • Performs freehand sketching of components. • Plans and selects materials for fabrication. • Innovates and modifies components. • Welds aluminium, copper, stainless steel, magnesium and cast iron alloys • Fabricates simple machines

Detailed Project Description	Duration
SUGGESTED PROJECTS • Forging of agricultural tools like hoes, knives, clippers and ox-plough shares • Forging of decorative/ornamental pieces • Fabrication of window and door structures • Fabrication of furniture Machine vice • Bevel slides • Bread mould boxes • Cylindrical • Fabrication of stands	40 Hours

Detailed Module Description of Year 1 Term 3

TCTM 101: Applied Technician Mathematics I

Duration: 32 Hours

Module Overview

This module introduces the learner to the concepts of complex numbers, vectors and matrices, their relevancy in construction industry and further career upgrading. The knowledge attained on this module will enable the learner in analyzing the flow of fluids in pipes.

Learning Outcomes

By the end of the module the learner should be able to:

- Solve equations involving complex numbers,
- Evaluate vectors

Competences

The learner:

- represents the identities applied in complex numbers.
- adds and subtracts complex numbers.
- manipulates equal, polar and exponential forms equations of complex numbers.
- graphically represents complex number to standard forms.
- manipulates equations involving vectors, by addition, subtraction and multiplication.
- represents vectors on graphs.

Detailed Module Description

Duration

Sub-module 6: Complex Numbers

16 Hours

- Equal complex numbers
- Graphical representation of complex numbers
- Polar form of complex numbers
- Exponential form of a complex number

Sub-module 7: Vectors

16 Hours

- Introduction to vector representation
- Manipulation of vectors
- Types of vectors
- Addition of vectors
- Subtraction of vectors

TCCS 101: Life Education

Duration: 16 Hours

Module Overview

The module introduces the learner to oral and interpersonal communication skills. It also equips him/her with knowledge about occupational working environment and creates in him/her public awareness on the impact and interventions to combat HIV and AIDS.

Learning Outcome By the end of the module, the learner should be able to: • Communicate effectively orally in the field of work. • Improve working environment for effective production and output. • Educate the public on the impact and interventions to combat HIV and AIDS in the Uganda.	
Competences The learner: • develops basic listening skills. • identifies the barriers to effective listening. • develops public speaking principles. • prepares for and conducts meetings. • makes an agenda for the meeting and writes minutes. • conducts interviews. • describes the roles of chairperson and secretary to the meeting. • educates public on importance of upholding good labour laws, good safety and health conditions at work. • Observes good labour laws and good safety and health conditions at work place and homes. • practises good labour laws and good health and safety. • manages and encourages voluntary counselling and testing (VCT) among the public and peers. • applies the qualities of a good counsellor during the counselling of the needy. • guides and encourages clients to visit places where they can access treatment and care. describes impacts /effects of HIV/AIDS in the families, communities and the country.	
Detailed Module Description	Duration
Sub-module 7: Oral Communication Skills • Listening and speaking • Conducting meetings and interviews • Phone messaging • Customer care language	06 Hours
Sub-module 8: Working Environment • Labour laws and regulations • Health and safety • Environment • Gender and mainstreaming of gender • Population growth / trends • Human rights • Social structure • Economic structure	04 Hours
Sub-module 9: Impact and Interventions of HIV and AIDS • Impact of HIV and AIDS	06 Hours

• Interventions to combat HIV and AIDS • Counselling and testing • Treatment, care and support • Mitigation of stigma and discrimination • Disclosure of HIV status ▪ HIV and AIDS workplace policy for Uganda ▪ Drugs and drug addiction	
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TCPL 101: Computer Applications

Duration: 32 Hours

Module Overview

The module enables the learner to acquire the required skills of working with presentations and basic networking for at least two computers. It enables the learner to start and manage a computer shop to create self-employment.

Learning Outcome

By the end of this module, the learner should be able to connect at least two computers to one local area network and share a printer.

Competences

The learner:

- prepares and edits work on Ms Power Point slides.
- activates animations on the selected slide design.
- Perfectly makes a PowerPoint presentation.
- runs a full slide show.
- differentiates between wireless and cable networking.
- connects a network cable to computers.
- installs network modem to a Personal Computer (PC).
- troubleshoots simple network connection problems
- Configures a network to computers

Detailed Module Description

Duration

Sub-module 8: PowerPoint Presentations

14 hours

- Creating a new presentation
- Opening and closing a presentation
- Saving a presentation document
- Transferring a presentation to a storage media in different formats
- Adding and formatting text, pictures and media
- Creating and running a slideshow
- Printing presentation slides

Sub-module 9: Basic Networking

18 hours

• Introduction to computer networking • Types of network: wide area networks (WAN), local area network (LAN) • Types of communication media: cables, wireless, optic fibres • Local area network topologies: star topology, ring topology, mesh topology, bar topology • Connecting a computer to a network • Configuring an Internet Protocol Address (IPA) • Creating a simple network of at least two computers • Sharing files between computers on a simple network • Troubleshooting simple connection problems • Connecting and configuring a printer on a network • General Internet safety and security regulations	
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TCWF101: Welding Practice I Time: 40 Hours	
Module overview The module enables learners to understand causes of welding defects, welding problems, and their remedies. Learners are also introduced to welding symbols interpretation, welding of thick plates in different positions (up to 10mmt)	
Learning outcome: By end of this module, the learner will be able to interpret welding symbols and join plates by welding (up to 10mmt) by welding and avoiding or applying remedies to welding problems/defects.	
Competences: By the end of this module, the learner should be able to: • Practices safety during operations • Identifies welding defects on joints and their causes • Classifies welding defects and corrects weld defects • Sets correct welding parameters and correctly selects welding filler metals • Describes residual stress, distortion, and warpage • Identifies possible causes of stresses, distortion and warpage • Devises possible solutions to minimize stresses, distortion and warpage • Identifies weld stresses, cracks and makes corrections • Identifies and interprets welding symbols • Interprets and applies welding symbols • Identifies types of welded joints • Prepares edges and welds joints • Perform welding in flat, horizontal, vertical, and overhead positions	
Detailed Module Description	Duration
Sub-module 11: Welding defects and remedies	

• Classification of weld defects • Arc welding defects (surface and sub-surface defects) • Corrective action for weld defects	08 hours
Sub-module 12: Welding problems, causes and remedies • Residual stresses • Distortion and warpage • Weld stresses and cracking • Remedies of welding problems	08 hours
Sub-module 13: Welding symbols • Standard welding symbol • Basic welding symbols	04 hours
Sub-module 14: Welding positions (thick plate up to 9mmt) • Safety practices when welding in different positions • Flat, horizontal, vertical and overhead welding positions	20 hours

TCWF102: Fabrication Practice I Duration: 40 hours
Module overview The module equips learners with skills in using machine tools, lathe, milling machines operations and general maintenance of machines, tools and equipment
Learning outcome By the end of this module, the learner should be able to: Operate workshop machines, use tools, jigs and fixtures and carry out general maintenance of machine shop tools and equipment.
Competences: The learner • Identifies occupational hazards and eliminate their causes • Protects the environment from radiation damage • Protects the environment from noise pollution • Operates machines safely • Identifies parts and functions of a lathe machines • Identifies and describes functions of tools, accessories, jigs and fixtures • Operates lathe machines • Performs turning and taper turning, boring, facing, parting-off and thread cutting operations • Identifies parts and functions of milling machines • Identifies tools, accessories, jigs and fixtures and describes their functions • Operates a milling machine and performs plane milling, Cuts key ways and Cuts spur gears

• Performs breakdown, Preventive, Periodic, Predictive and corrective maintenance on machines and equipment • Interprets working drawing • Transfers measurements from working drawings to work pieces • Fabricates different items • Grinds, files, polishes and coats surfaces • Describes general guiding principles of furniture fabrication • Fabricates different types of furniture (office and domestic) • Describes different metal fining methods • Grind, file, polish, and coat fabricated work	
Detailed Module Description	Duration
Sub-module 9: Lathe machines operations • Safety practices when operating and maintaining lathe machines • Industrial hygiene, Occupational noise and Radiation • Parts and functions of lathe machines • Lathe machine tools, accessories, jigs and fixtures • Lathe operations (Taper turning, Facing, Turning, Parting-off, Thread cutting, Boring)	06 hours
Sub-module 10: Milling • Safety practices when operating and maintaining lathe machines • Types of milling machines • Parts and functions of milling machines • Milling tools, accessories, jigs and fixtures • Milling operations (plane milling and gear cutting)	06 hours
Sub-module 11: General maintenance of machines, tools and equipment • Introduction to maintenance(breakdown maintenance, preventive maintenance, periodic maintenance, predictive, and corrective maintenance)	04 hours
Sub-module 12: Fabrication of furniture and simple objects • Guiding principles and practice of office furniture fabrication(chairs, desks, shelves, cabinets, tables) • Guiding principles and practice of domestic furniture fabrication(chairs, shelves, cabinets, tables, beds)	06hours
Sub-module 13: Fabrication of shutters frames and burglar proofing • Door and window frames/shutters • Burglar proofing	06hours
Sub-module 14: Finishing work • Grinding, filing, polishing, coating (painting, spray painting, galvanizing and electroplating)	04 hours

Sub-module 15: Introduction to Foundry work • Safety practices when doing foundry work • Foundry terminology • Types of foundry work • Tools and equipment • Advantages and disadvantages of casting • Making the shell • Types of patterns • Pattern making • Sand preparation • Moulding and core making • Curing of moulds • Gating and risering of castings • Melting and pouring of molten metal • Removal and finishing of castings	06Hours
Sub-module 16: Defects in foundry and sand casting • Tears and cracks • Shrinkage • Porosity • Dimensional defects	2 Hours

TCWF103 Materials Time: 24 Hours
Module overview The module introduces learners to failure and deformation of metals, powder metallurgy and equips learners with skills in welding plastic materials
Learning outcome By the end of this module, the learner should be able to: Relate deformation of materials to applied forces and weld plastic materials
Competences The learner: • Determines stress, strain, tension, compression of materials • Relates stress, strain, tension, compression to failure and deformation of materials • Identifies the causes of ductile and brittle failures and how it affects fabrication of materials • Describes the process of manufacturing powder, compacting, and sintering • Describes the processes of powder metallurgy and state applications • Identifies products made by powder metallurgy technology and state their

uses • Identifies different types of plastics and methods of welding • Describes characteristics and applications of plastics • Performs welding of plastics • Describes behaviour of materials under ductile and brittle failure	
Detailed Module Description	Duration
Sub-module 7: Introduction to failure and deformation of metals • Stress and strain • Tension and compression: Direct stress • Ductile failure • Brittle failure	10 hours
Sub-module 8: Introduction to powder metallurgy • Powder manufacturing, compacting, and sintering • Application of powder metallurgy	04 hours
Sub-module 9: Plastic materials • Introduction to plastics • Weldability of plastics	10 hours

TCWF 104: Technical Drawing I Duration: 24 Hours	
Module overview The module introduces learners to surface development of objects	
Learning outcome By the end of this module, the learner should be able to: Develop surfaces of objects.	
Competences The learner: • Develops surfaces of different objects: rectangular prisms, hexagonal • Draws pyramids, cylinders, truncated cylinders, and cones • Uses triangulation method of developing surfaces	
Detailed Module Description	Duration
Sub-module 5: Surface development • Development of surfaces of rectangular prisms, hexagonal pyramid, cylinder, truncated cylinder, and cones • Lines of intersection and development • Development of intersection pipes, lines of intersection between cylinders • Development by triangulation.	24 Hours

TCWF 105: Real life project I Duration: 32 hours	
Module Overview This module equips the learner with the practical skills in fabrication of components using welding, casting and machining processes.	
Learning Outcomes By the end of this module, the learner should be able to fabricate components from different materials using various processes like; welding, casting and machining processes.	
Competences The learner: • perform risk assessment and Safe Job Analysis for the project • prepares safety reports • Welds plastics • Casts components • Welds thick metal pieces (up to 9mm thickness) • Fabricates furniture articles • Develop surfaces and fabricate sheet metal objects • observes safety, health, security and environmental considerations when executing project tasks	
Detailed Project Description	Duration
SUGGESTED PROJECTS • Fabrication of furniture articles (e.g. chairs, tables, beds, stands, racks) • Casting of aluminium decorative articles • Casting of art pieces • Fabrication of plastic containers and articles • Fabrication of screw jacks • Fabrication of vehicle wedges and stands • Development and fabrication of cones, oblique, truncated cone/pyramid frustums, square hoppers • Development and fabrication of pipe joints at different angles • Development and fabrication of chimneys • Fabrication of furniture products • Fabrication of simple roof trusses	32 Hours

TCWF 106 Industrial Training I Duration 288 Hours	
Module over view This module introduces the concept of attachment of learners to companies Industries, Workshops and practical training in welding and metal fabrication works.	
Learning outcome By the end of the Industrial training, the learner should be able to demonstrate proficiency in practical skills in casting, welding and fabrication	
Competence By the end of the training, learners should be able to: • Familiarize with industrial and site setting, tools and equipment used for doing the required work. • Perform welding and its related tasks • Operate various types of welding machines and use tools and equipment • Maintain welding equipment • Apply paints on finished surfaces • Write and make presentation on industrial/field/site work • Set out and start fabricating a door • communicate with work mates and supervisors • Take and implement instructions • Write an industrial training report	
Detailed Module Description	Duration
Sub-module 1: First Industrial training in: • safety considerations on site operations • site ethics • design, drawing and interpretation of drawings • costing and estimation for work/labour • Welding parts using arc and gas welding processes • Gas cutting of metal plate • Fabrication of components • Casting of components • Forging • Repair and maintenance of components • Report writing	288 hours

Detailed Module Description of Year 2 Term 1

TCTM 201: Applied Technician Mathematics II	
Duration: 40 Hours	
Module Overview The module introduces the learner to equations, elementary polynomials and binomial theorem, their application and importance in manufacturing industry.	
Learning Outcome By the end of this module, the learner should be able to: • Manipulate expressions of equations • evaluate polynomial equations applied in vibrating systems of vehicles and structures • apply binomial theorem in determining oscillations and frequencies of materials	
Competences The learner: • evaluates independent variables. • transposes various formulae. • applies the transposition of formulae in manipulating and solving production related problems. • factorises quadratic equation. • solves polynomial equations by applying the remainder theorem. • solves general polynomial equations. • expresses binomial theorem on Pascal's triangle. • manipulates binomial theorem equations.	
Detailed Module Description	Duration
Sub-module 1: Expressions of Equations • Evaluating expressions • Equations • Evaluating independent variables • Transposition of formulae	12 Hours
Sub-module 2: Polynomial Equations • Polynomial expression, equations of polynomials • Remainder theorem • Factorization of quadratic polynomials	14 Hours
Sub-module 3: Binomial Theorem • Expansion of binomial expressions: Pascal's triangle, the binomial theorem for 'n' a positive integer • The general binomial expansion $(1+x)^n$ for $1 < x < 1$ and for $1 < x > 1$	14 Hours

TCBE 201: Entrepreneurship Skills	
Duration: 30 Hours	
Module Overview	
The content for term one introduces the learner to fundamentals of entrepreneurship that enable one to scan the environment for viable business opportunities. The learner will acquire entrepreneurial skills to turn challenges into opportunities by taking risks through planning, creativity and innovation.	
Learning outcomes	
By the end of this term, the learner should be able to;	
• Appreciate and confidently practice entrepreneurship • Conduct a feasibility study • Mobilize resources and start up an enterprise	
Competences	
The learner:	
• Differentiates entrepreneurship from ordinary business ventures • Exhibits qualities of a good entrepreneur • Practices entrepreneurial ethics • Scans the environment for business opportunities • Generates ideas for the business • Selects a viable business idea • Obtains rights to protect personal business. • Portrays the characteristics of innovativeness and creativity • Identifies forces of innovation • Devises means of overcoming barriers to creative thinking • Selects the most appropriate form of business enterprise to operate. • Draws a simple business plan • Prepares simple budget for the business • Registers a business • Mobilises resources for starting a business. • Locates a business in a suitable environment	
Detailed Module Description	Duration
Sub – Module 1: Introduction to Entrepreneurship	03 hours
• Meaning of entrepreneurship • Qualities of an entrepreneur • Entrepreneurial ethics	
Sub – Module 2: Environmental Analysis	10 hours
• Meaning of environment • Scanning the environment for Business opportunities • Generating business ideas • Evaluation and selection of business ideas • Protection of business (Trademark and patent rights)	

Sub – Module 3: Innovation And Creativity • Meaning of Innovation And Creativity • Characteristics of innovative persons • Forces of innovation • Barriers to creativity and innovation	4 hours
Sub – Module 4: Business Planning • Forms of small business ownership (Sole proprietorship and Partnership) • Uses of a business plan • Parts of a business plan • Designing a simple business plan • Developing a simple budget	09 hours
Sub – Module 5: Implementing a Business Plan • Registering a Sole proprietorship and Partnership • Mobilising business resources - Financial resources - Human resources - Plant, Machinery and Equipment • Locating a business	04 hours

TCCS 201: Basic Kiswahili	
Duration: 20 Hours	
Module Overview This module introduces the learner to the basic Kiswahili used in the industry and by general public to carry out daily business. It also enables the learner carry out his/her profession in any part of East Africa where Kiswahili language is the major language of communication.	
Learning Outcome By the end of the module, the learner should be able to seek for help and transact business in Kiswahili..	
Competences The learner: • acknowledges the importance of learning and using Kiswahili language. • greets peers, parents and supervisors in Kiswahili. • names places and people in their capacities. • appreciates others by saying ‘thank you’ and ‘well-done’ in Kiswahili.	
Detailed Module description	Duration
Sub-module 1: Introduction to Kiswahili • Origin and widespread of Kiswahili • Importance of Kiswahili to Ugandans and other East African countries	2 Hours

Sub-module 2: Polite Language • Greetings to peers, age mates, parents, elderly and supervisors • Salutations at different times of the day • Appreciation and saying thank you for work done, gifts, food and so on • Asking for directions, assistance and food and so on • Names of places, like schools, hospitals, markets, garages, roads, airports, water wells, forests, villages, towns, sites, hills • Names of people and professional titles like technicians, nurses, messengers, watchmen, drivers, doctors, teachers and students	18 Hours
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TCWF201: Welding Practice II Duration: 50 Hours	
Module overview: The module introduces learners to pipe welding, tubing, welding standards, procedure and weld specifications.	
Learning outcome: The learner interprets welding standards, formulates welding procedures, welds pipes, tubing that pass standard tests, observe safety precautions and protect the environment.	
Competences: By the end of this module, the learner should be able to: • Observe safety when testing welds • Describe types of welding procedures • Weld following specified welding procedures • Make simple welding procedures • Test welds following welder qualification standards • Prepare tubular items for welding • Prepare welding procedures • Weld pipes and tubing of different materials using different welding processes and techniques	
Detailed Module Description	Duration
Sub-module 1: Welding procedure • Introduction to welding procedure (welding codes and specifications) • Procedure specification • Procedure qualification • Welder qualification	22 hours
Sub-module 2: Welding pipes and tubing • Safety practices when welding pipe and tubing	28 hours

• Classification of Tubular items • Welding pipes and tubing (Mild steel, Copper and alloyed pipes, stainless steel and galvanized pipes)	
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TCWF 203: Fabrication Practice II Duration: 50 Hours	
Module overview: This module introduces learners to fabrication of sheet metal products like; shovel, meter boxes, tool boxes, ducts, troughs charcoal stove, door panels, containers, watering can, wheel burrow bucket, shutter panels, water gutters, cones, buckets, dust bins, sign plates	
learning outcome: By the end of the module, the learner should be able to design, draw and fabricate items, observe safety and protect the environment.	
Competences: By the end of this module, the learner should be able to: • identifies and selects the suitable material, sheet metal tools, machines and equipment • operates sheet metal processing machines and equipment • performs basic maintenance of sheet metal processing machines and equipment • produces a material usage plan • marks out surfaces and makes developments of sheet metal patterns and products • makes working templates and cuts sheet metal • performs pressing, drawing, shearing, squeezing, bending, punching, edge	

curling, incurvating, hollowing and raising, roll forming, swaging and levelling of sheet metal	
Detailed Module Description	Duration
Sub-module 1: Sheet metal working tools, machines, equipment and their maintenance • Safety practices when operating sheet metal processing machines • Sheet metal hand/machine tools and equipment • Sheet metal processing machines	22 hours
Sub-module 2: Sheet metal processes • Material usage plan • Measuring and marking out sheet metal • Patterns and pattern making/drafting • Sheet metal joints • Sheet metal operations (press working processes, drawing, shearing, squeezing, bending, punching, roll forming and spinning operations) • Fabrication of cylinders, boxes, ducts, cones, channel, frustrums from sheet metal	28 hours

TCWF 204: Computer Aided Design (CAD) Duration: 30 Hours
Module overview: The module introduces learners to Computer Aided Design (CAD), limits and tolerance drawing techniques as applied in engineering designs
Learning outcome: The learner uses a Computer and CAD software to design and draw articles.
Competences: The learner: • Opens a computer and launches AutoCAD • Identifies various commands and their application in manipulating CAD drawings • Designs real domestic and industrial articles using CAD software's and a computer • Sets the required dimensions and applies them on the drawings • Hatches and paints the drawings • Formats text and labels the drawing correctly. • Sets the drawing sheets correctly • Connects the printer/plotter to the computer and prints out drawings

Detailed Module Description	Duration
Sub-module 1: Introduction to AutoCAD • Launching AutoCAD on a Computer • Properties command - Line properties and setting - Colour properties and setting - Layer setting • Draw commands - Horizontal and vertical lines - Arcs and cycles - Angle line and setting - Hatch and gradient • Command line - Perpendicular and free turning lines - Object snap tracking and setting - Grid settings • Modify commands - Trim and extend lines - Fillet and chamfer junctions - Rotate and mirror drawings - Offset to form drawings - Erase lines and drawings - Explode blocked drawings - Scale • Annotation commands - Standard dimensioning - Linear, aligned and angular dimensioning - Diameter and radius dimensioning - Dimension settings - Text formatting and type setting • Clip board commands - Cut clip, copy clip, move lines and drawings - Paste clips and drawings - Match properties • Setting drawing sheet in AutoCAD	24 Hours
Sub-module 2: Limits and Tolerances • Tolerance (grades and accumulation) • Fits and tolerances • Geometry and tolerances • Surface finish • Hole basis fits system • Shaft basis fits system	06 hours

TCWF 205: Real life project II Duration: 40 hours	
Module Overview This module equips the learner with the practical skills in welding pipes and tubing, application of limits and tolerances, sectioning in machine drawing and the use of sheet metal working tools, machines, equipment, their maintenance and application of sheet metal processes to fabricate articles and components.	
Learning Outcomes By the end of this module, the learner should be able to: Plan, select materials appropriately and fabricate components to suit client's design needs, , observe safety and protect the environment.	
Competences The learner: • prepares safe job analyses (SJAs) for the project • prepares safety reports • Produces machine drawings • Applies limits and tolerances to design components • Identifies and uses sheet metal tools • Uses sheet metal machines and equipment to fabricate sheet metal products • Maintains sheet metal machines and equipment • Fabricates sheet metal products • Welds pipes and tubing	
Detailed Project Description	Duration
SUGGESTED PROJECTS Domestic sheet metal products • Compound and house cleaning tools (dust pan, shovel) • Kitchen ware (Ladle, fork, frying pan, cake and bread moulds, tray, buckets, sieves) • Garden tools (spade, watering can, pruning scissor, wheel burrow tray, shovel, rake, basin) • Boxes (meter box, tool box, metal suitcase) • Manufacture of articles like: tanks and containers, automotive panels and load bodies, cabinets, canopies, chimneys, exhaust, pipes/silencers, frustums, ducts, gutters, cones and intersecting sections of sheet metal machines • Welded pipe structures	40 Hours

Detailed Module Description of Year 2 Term 2

TCTM 201: Applied Technician Mathematics II

Duration: 40 Hours

Module Overview

The module introduces the learner to engineering calculus used in determining the estimated loads that the structure is expected to carry.

Learning Outcome

By the end of this module, the learner should be able to calculus in determining the bending moments of beams and other structures .

Competences

The learner:

- differentiates the variables from first principle.
- differentiates the product and quotient.
- applies differential equations in determining beam deflections .
- applies integral equations to evaluate the extent of beam deflections.
- determines gradient of a curve.
- uses integration principle to determine the size and area of a simple structure.
- adds fractions to get a common denominator.
- manipulates functions in rules.
- applies inverse of a function.
- draws graphs.

Detailed Module Description	Duration
Sub-module 4: Differentiation • Differentiation from first principle • Differentiation of product and quotient • Choice of variable	14 Hours
Sub-module 5: Integration - Single and Double Integrals • Standard integrals • Functions of linear function of 'x' • Integration of polynomial functions • Integration by partial fractions • Areas under curves	16 Hours
Sub-module 6: Elementary Functions. • Functions in rules • Functions and the arithmetic functions • Inverse of function and graphs	10 Hours

TCBE 201: Entrepreneurship Skills

Duration: 30 Hours

Module overview

This term's content is intended to equip learners with knowledge, competences, and skills to successfully engage in production and manage a small business. The learner will be trained on how to produce quality goods/services for sale, market the products, and control the financial and human resources of the business.

Learning outcomes

By the end of the module, the learner should be able to;

- Produce quality goods and services
- Enhance competitiveness of the product through market survey
- Competently manage business finances
- Correctly guide and control the business work force

Competences

The learner:

- Determines the cost of production
- Designs appropriate packaging for the product
- Adds value to the product
- Carries out a market survey
- Applies the 4Ps in marketing a product
- Promotes the products for sale
- Maintains basic business records
- Computes business profits/losses
- Prepares simple income statements, Balance sheet and cash flow statements
- Orients employees on business issues
- Maintains a motivated workforce
- Appraises staff
- Incorporates a compensation policy for the employees.
- Shares responsibilities with employees
- Recognizes the contribution of workmates.
- Identifies causes of conflicts in small enterprises
 - Resolves conflicts at the work place

Detailed Module Description**Duration****Sub – Module 6: Production**

- Production costing
- Packaging (Protection , Handling and Preservation of a product)
- Value addition

06 hours

Sub – Module 7: Marketing

- Market survey
- Marketing mix {Price, Place, People, Product (4Ps)}
- Sales promotion

06 hours

Sub – Module 8: Financial Management • Bookkeeping (Recording transactions, Source documents, Journals, Balancing accounts, Trial balance, Bank reconciliation, Simple Income statement, Simple balance sheet) • Simple Cash flows	12 hours
Sub – Module 9: Human Resource Management • Orientation • Importance of motivation • Performance Appraisal • Compensation in compliance with labour laws • Need for delegation and challenges encountered • Importance of team work • Settling conflicts at workplace	06 hours

TCCS 201: Basic Kiswahili Duration: 20 Hours	
Module Overview This module introduces the learner to the basic Kiswahili used in the industries and by the general public to carry out daily business.	
Learning Outcome By the end of the module, the learner should be able to transact business in Kiswahili.	
Competences The learner: • counts numbers 0-1000000 in Kiswahili. • identifies and names the parts of the human body in Kiswahili. • names domestic animals, birds and insects in Kiswahili. • mentions the days of the week, names the months of the year and tells the correct dates.	
Detailed Module Description	Duration
Sub-module 3: Comprehension • Vowels a e i o u • Consonants b, ch, d, dh, f, g, gh, h, j, k, l, m, n, ng, ny, p, r, s, sh, t, th, v, w, y, z. • Counting and numbers 0-9, 10- 1000000 • Daily and common activities and sayings: ‘welcome’, ‘have a seat’, ‘thank you’, ‘wish you well’, ‘sorry’ • Parts of the human body like head, legs, hands	10 Hours

Sub-module 4: General Vocabulary - Names of domestic animals like goats, sheep, cows, pigs, rabbits, dogs, cats - Names of domestic birds like ducks, turkeys, hens - Names of insects like mosquitoes, flies, cockroaches - Months in a year, days of the week, dates and telling time - Names of objects like doors, windows - Common usage of Kiswahili, home and garden activities - Common mistakes to be avoided	10 Hours
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TCWF201: Welding Practice II Duration: 50 Hours	
Module overview The module introduces learners to advanced welding skills in Metal Active Gas (MAG), Metal Inert Gas (MIG), and Tungsten Inert Gas (TIG) welding processes	
Learning outcome By the end of the module the learner should be able to: apply advanced welding processes and techniques to weld mild steel, aluminium and stainless steel materials, observe safety and protect the environment.	
Competences The learner: - Observe safety precautions when performing MAG, MIG and TIG welding - Identifies tools and MAG welding equipment - Handles and operates MAG welding tools and equipment - Selects suitable filler materials/electrodes for MAG welding - Applies shielding gas during welding - Prepares work pieces - Joins work by MAG welding - Identifies tools and MIG welding equipment - Handles and operates MIG welding machines, use tools and equipment - Selects suitable filler materials/electrodes for MIG welding - Prepares work pieces - Applies shielding gas during welding - Joins work by MIG welding - Identifies tools and TIG welding equipment - Handles and operates TIG welding tools and equipment - Selects suitable filler materials/electrodes for TIG welding - Applies shielding gas during welding - Prepares work pieces - Joins work by TIG welding	
Detailed Module Description	Duration
Sub-module 3: Metal Arc Gas (MAG) welding	20 hours

• Safety considerations when performing MAG welding • Tools and MAG welding equipment and accessories • Principles of operation of MAG equipment • Uses, advantages and disadvantages • Electrodes and shielding gases • MAG welding practice	
Sub-module 4: Metal Inert Gas (MIG) welding • Safety considerations when performing MIG welding • Tools and MIG welding equipment • Principles of operation of MIG equipment • Uses, advantages and disadvantages • Electrodes and shielding gases	12 hours
Sub-module 5: Tungsten Inert Gas (TIG) welding • Safety considerations when performing TIG welding • Tools and TIG welding equipment • Principles of operation of TIG equipment • Uses, advantages and disadvantages • Electrodes and shielding gases	18 hours

TCWF203: Fabrication Practice II Duration: 50 Hours
Module overview: This module introduces learners to fabrication of simple trusses and structures, construction and repair of bodies and panels of; cars push carts, motor and bicycle trailers.
Learning outcome By the end of this module, the learner should be able to fabricate structures and repair panels/car bodies, observe safety and protect the environment.
Competences The learner: • Practices safe truss fabrication • practices safe riveting, bolting and welding of frames • selects and correctly uses panel beating tools and equipment • perform surface preparation and finishing • correctly applies adhesives and mechanical fastening on bodies • re-aligns deformed areas, applies body fillers and paint or vanishes to the required finish surfaces • applies safety requirements of truss fabrication • designs, draws and interprets truss drawings • estimates materials for a given or designed truss

• fabricates trusses like howe, warren, pratt, fink, crescent, fan, cambered, bow-string trusses • identifies and chooses appropriate type of connecting parts • constructs rivets, bolts and their accessories • makes connections by riveting, bolting and welding. • observes and complies with the safety requirements and standards • Fabricates structures that make frames for bridges, canopies, rails, bicycles, push carts, trailers, and wheel burrows	
Detailed Module Description	Duration
Sub-module 3: Introduction to vehicle body repair and finishing • Safety considerations when performing vehicle body repair and finishing operations • Equipment and tools for body work • Adhesive bonding • Mechanical fastening (riveting, bolting, welting, clenching) • Body repair • Realignment • Paints • Surface preparation and priming (surface preparation materials, application of fillers, sealants and foundation materials, refinishing topcoats)	20 hours
Sub-module 4: Fabrication of Trusses • Safety considerations when performing truss fabrication work • Types of roof trusses (Howe, Warren, Pratt, Fink, Crescent, Fan, Cambered, Bow-string trusses)	16 hours
Sub-module 5: Steelworks • Riveted connections • Bolted connections • Pinned connections • Welded connections • Construction of frames of bridges and framed products	14 hours

TCWF 202: Computer Aided Design (CAD) Duration: 30 Hours	
Module overview: This module equips learners with the skills of making machine drawing and their sections using AutoCAD. It further enables the learner to resolve and determine forces on structures using the graphical method there by producing working and part drawings	
learning outcome By the end of this module, the learner should be able to: • Design and draw machine parts • Determine forces on structures using the graphical method Competences The learner: • identifies screw thread Fundamentals • classifies thread series • draws screw bolt and nut on drawing board and by using AutoCAD • draws spur gears, cams and cam profiles on drawing board and by using AutoCAD • identifies and interprets welding symbols • interprets working drawings • sections drawings to show the exposed interior and hidden details • hatches sectioned drawings and represent it with the correct symbols using AutoCAD. • uses hatching lines to show the cut plane • shows by drawing half of the object removed to show the internal detail • show the exterior and interior of a symmetrical object in a single projection view • uses graphical method to determine resultants and reactions of forces (acting on a beam, roof trusses and truss reactions) • develops parts and assembly drawings • determines the required forces of beams and trusses by applying graphical drawing methods	
Detailed Module Description	Duration
Sub-module 3: Machine drawing • Threads and screw bolt connections • Hexagonal bolts and nuts • Spur gears • Radial cams • Welding symbols' interpretation on working drawings	10 hours
Sub-module 4: Sectioning	10 hours

• Full sectioning • Half sectioning	
Sub-module 5: Drafting design • Graphical method of finding resultants and reaction of forces (acting on beams and truss) • Part drawing and assemblies • Working drawings	20 hours

TCWF 210: Real life Project II Duration: 40 Hours	
Module Overview This module provides learners with skills in advanced drafting design, vehicle body repair and refinishing, fabrication of trusses, steelworks, using Metal Arc Gas (MAG) welding, Metal Inert Gas (MIG) welding, Tungsten Inert Gas (TIG) welding processes	
Learning Outcomes By the end of this module, the learner should be able to: Fabricate and repair components/body surfaces of different materials using modern welding processes like; MAG, MIG and TIG welding processes, observe safety and protect the environment.	
Competences The learner: • prepares safe job analyses (SJAs) for the project • prepares safety reports • Selects the suitable material for roof truss fabrication • Designs and fabricates simple roof trusses • Carries out panel biting on deformed car bodies and repairs the damaged parts • Fabricates water, fuel and milk tanks using aluminium materials • develops parts and assembly drawings • designs and fabricates pulleys, rails, frames of bicycles, push carts, trailers, and wheel burrows	
Detailed Project Description	Duration (Hours)

SUGGESTED PROJECTS • Simple roof trusses e.g. for tents • Car body repairs • Stainless and aluminium containers • Framed products: e.g. canopies, rails, frames of bicycles, push carts, trailers, and wheel burrows • Balustrades/grills	40
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Detailed Module Description of Year 2 Term 3

TCTM 202: Applied Technician Mathematics II Duration: 32 Hours	
Module Overview The module introduces concepts of set theory as may be applied in mixing ratios and basic statistics used in recording of day work and site progress. The knowledge attained in this module also enables the learner to tally any collected data for a particular purpose, leading to a realistic making of an informed decision.	
Learning Outcomes By the end of this module, the learner should be able to: • apply the set theory in batching roofing materials. • apply the skills of illustrating histograms in drawing the industrial operation programme.	
Competences The learner: • identifies and groups elements of a set. • analyses the difference between union, sub-sets and intersection of sets. • applies set theory in grouping engineering materials. • analyses the relationship between set theory with that of ratios and proportions of engineering materials. • records information on frequency distribution sheet. • determines the average of given data . • draws histograms representing given information • applies the mean arithmetic in analysing the site activities for monthly salary and over time allowances of workers. • applies the assumed mean for calculating standard deviation of materials costs in the market.	
Detailed Module Description	Duration
Sub-module 7: Theory of Sets • Elements of sets • Union of sets • Intersection	18 Hours
Sub-module 8: Basic Statistics • Recording of the information and frequency distribution • Types of average • Histograms • Calculation of mean, Standard deviation and Assumed mean	14 Hours

TCBE 201: Entrepreneurship Skills	
Duration: 24 Hours	
Module overview The content for this term introduces learners to regular business support services to enable successful sourcing for funds to boost the business, manage risks and follow best practices in the industry. It will equip learners with skills to manage contracts, lobby for financial services, insure business, and adhere to tax requirements.	
Learning outcomes By the end of the term, the learner should be able to; • Execute a contract economically and efficiently. • Save and invest in the business. • Insure the business. • Pay taxes.	
Competences The learner: • looks for contract information • fills and prepares a simple bid document • complies with the contract requirements • opens and manages a bank account • acquires and services a loan • selects the most appropriate insurance policy for the business and their lives. • observes the insurance principles • manages the challenges encountered in insurance • seeks for compensation when loss is suffered • recognizes the importance of paying taxes • identifies the taxes paid by small businesses • calculates the tax payable • files tax returns	
Detailed Module Description	Duration
Sub – Module 10: Contracting Process • Sources of contract information • Bid preparation • Contract execution and compliance	06 hours
Sub – Module 11: Banking • Services offered by Commercial banks, Micro finance institutions and SACCOs • Types of accounts (savings, current and fixed deposit) • Acquiring and servicing loans	06 hours
Sub – Module 12: Insurance for Small Businesses • Life assurance and property insurance • Principles of Insurance • Process of getting compensation	06 hours

Sub – Module 13: Taxation and other Business Dues • Reasons for paying taxes • Common taxes paid by small businesses - Local service tax, - Property tax - VAT - Income tax - Market dues - Ground rent - Trade Licence • Calculating VAT and Income tax payable • Filing tax returns	06 hours
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TCCS 201: Basic Kiswahili Duration: 16 Hours	
Module Overview The module equips the learner with the professional use of Kiswahili in engineering works execution and management. It helps the learner give instructions to teammates or those he/she is working with and may not be familiar with the English language.	
Learning Outcomes By the end of this module, the learner should be able to: • name the tools, equipment and materials used in engineering . • outline the titles of the personnel involved in carrying out engineering works • use basic Kiswahili in the day to day running of the business. •	
Competences The learner: • Safely practices safety when performing DT, NDT and pressure leak tests • identifies and names the tools and equipment and states their uses in Kiswahili. • differentiates the responsibilities and tasks performed by technicians in Kiswahili. • identifies and names the materials used in engineering. • develops good attitude towards work, customers and the general public. • welcomes and handles customers with care and willingness in Kiswahili. • advertises the product in Kiswahili.	
Detailed Module Description	Duration
Sub-module 5: Specific Trade (Professional related) Vocabulary • Names of tools and equipment used by a technician • Tasks performed by a technician • Titles of officers in engineering • Names of materials used in engineering	6 Hours

Sub-module 6: Customer Care and Language • Attitude to customers, public and the job • Public relations and persuasive business language • Advert of products • Handling customers: welcoming them, asking whether they need help, and thanking them	10 Hours
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TCWF202:Welding Practice II Duration 40 hours	
Module overview This module introduces learners to weld testing, material estimation and weld costing	
Learning outcome By the end of this module, the learner should be able to prepare material estimates and costs, test welded components and articles, observe safety and protect the environment.	
Competences The learner : • determines appropriate weld testing methods for given tasks • applies Destructive, Non-Destructive, and pressure leak testing methods to test welds • estimateswelding material quantities • determines welding costs for given jobs	
Detailed Module Description	Duration
Sub-module 6: Weld inspection and Tests • Safety considerations when performing DT, NDT and pressure leak tests • Introduction to quality control • Destructive Tests (DT) • Non-destructive Tests (NDT) • Pressure and leak tests	20 hours
Sub-module 7: Weld costing • Weld cost elements • Weld metal (filler metal), and material requirements • Welding power and gas overhead costs • Time and Labour requirement • Taxes (V.A.T, Local government taxes, PAYE, Income tax)	20 hours

TCWF 203: Fabrication practice II Duration: 40 Hours	
Module overview: This module enhances the learner's fabrication skills to make jigs and Fixtures	
Learning outcome: By the end of this module, the learner should be able to: Fabricate jigs and fixtures, observe safety and protect the environment.	
Competences The learner: • safely fabricates and applies jigs and fixtures • plans work • estimates costs of production (materials, labour and utilities) • produces jigs and fixtures • controls quality • produces complete articles using different fabrication methods and skills • estimates and costs materials • costs for labour required in doing the planned and work at hand • calculates overheads and depreciation of tools and equipment	
Detailed Module Description	Duration
Sub-module7: Fabrication of jigs and fixtures • Safety considerations when fabricating and applying jigs and fixtures • Fabrication and application of jigs and fixtures • Mass production (TWP-Training With Production) • Quality control	24 hours
Sub-module 7: Estimation and costing of labour and materials • Material estimation and costing • Labour costs • Over heads and depreciation of equipment	16 hours

TCWF 202: Computer Aided Design (CAD) Duration: 24 Hours	
Module overview: This module equips learners with the skills and techniques of designing and drawing components using Computer Aided Design (CAD)	
learning outcome By the end of this module, the learner should be able to: • Draw various components using CAD application. Competences The learner: • identifies and use the CAD tool bars • produces drawings using CAD • plots the drawings to paper (printing)	
Detailed Module Description	Duration
Sub-module 6: Computer Aided Design (CAD) practice • design and drawing of tables, chairs, wardrobes, roofs, beds and doors • design and drawing of machine parts • dimensioning of drawn components • typesetting text and labelling of drawn components • sectioning, hatching, moving, erasing, mirror and rotate objects • setting out drawing sheets with title block • printing and plotting of the drawn components	24 hours

TCWF 205: Real life project II Duration: 32 Hours	
Module Overview This module equips the learner with the practical skills in weld inspection and testing, Computer Aided Design (CAD), fabrication of jigs and fixtures, estimation and costing of labour and materials	
Learning Outcomes By the end of this module, the learner should be able to: To perform weld inspection, use CAD software, fabricate jigs and fixtures, observe safety and protect the environment.	
Competences The learner: • prepares safe job analyses (SJAs) for the project • prepares safety reports • inspects and tests welds	

• uses CAD software to draft • fabricates jigs and fixtures	
Detailed Project Description	Duration
SUGGESTED PROJECTS • Design components using CAD • Estimate and cost components • Bar bending jigs, plate punching and forming jigs, steel fabrication jigs • Innovate on any usable component • Write the project report	40 Hours

TCWF 206: Industrial Training II Duration: 288 Hours	
Module overview: The module involves attachment and practical training in maintenance and manufacturing.	
Learning outcome: By the end of the training, learners should be able to Attain practical skills in welding and fabrication, observe safety, protect and maintain the working environment.	
Competence: The learner: • prepares safe job analyses (SJAs) for the project • prepares safety reports • fabricates jigs and fixtures • fabricates machines and machine components • operates equipment with minimum supervision • carries out more complex tasks • writes an industrial training report	
Detailed Module Description	Duration
Sub-module 1: Training in: • Machine design and fabrication and its related tasks • Write and make presentation on industrial/field/site work • Set out and start welding machine parts • Production and manufacturing. • Maintenance scheduling and repair. • Record keeping • Communication with work mates and supervisors • Communication with superiors	288hours

APPENDICES

Appendix I: Industrial Training Guidelines

The guide lines below should be followed during Industrial Training:

- i) It starts at the end of the **3rd term**
- ii) It takes a minimum period of **6 weeks**
- iii) It is carried out at the world of work located in any part of Uganda including the training Institutions
- iv) The training Institution has the duty of;
 - budgeting for Industrial Training;
 - obtaining money from government for government sponsored learners;
 - explaining to the learners what they are expected to do;
 - finding placements for Industrial Training;
 - posting learners to Industrial Training placements; and
 - supervising and assessing learners during Industrial Training.

Supervision

- i) There should be a world of work or field or industry supervisor and an academic supervisor from the training Institution.
- ii) The academic supervisor visits the attachment site or industry at least once and interacts with both the learner and the field supervisor.

Assessment

Assessment marks should be categorised as follows:

- i) Assessment by field supervisor 50%
- ii) Assessment by academic supervisor 30%
- iii) Field attachment report 20%

All the above assessment categories must be carried out for one to complete Industrial Training. The marks awarded in each category should be verified by the mandated examining body.

Appendix ii: Industrial Training Assessment Form for Field or Onsite Supervisor

Name of institution.				
Name of industry.				
Name of student.				Signature.
Registration.				
Name of supervisor.				Signature.
Date.				
	Area of Assessment	Marks	Score	Area of Improvement
A	Attendance (% age of days and times within the days present)	5		
B	Work Performance involvement	35		
	1. Co-operation with other staff	5		
	2. Ability to communicate effectively	5		
	3. General ability to use various equipment, machines or plant in the industry	10		
	4. Flexibility-willingness to learn from various sections in industry	7		
	5. Job planning	8		
C	Initiative and Innovations	15		
	1. Problem-solving	8		
	2. New ideas on improvement for efficiency of performance or operations	7		
D	Time Management	5		
	1. Reporting on time	1		
	2. Leaving at specified break-off or stoppage time	1		
	3. Meeting deadlines on assignments given by supervisors or instructors	3		
E	Discipline and Safety Observation	15		
	1. Use of right equipment for right job	4		
	2. Obeying instructions	4		
	3. Proper handling of equipment and or materials	2		
	4. Ability to practice safety measures in the workplace	3		
	5. Knowledge of first aid procedures in case of	2		

	accident			
F	Practical Skills	20		
	1. Ability to put into practice training instructions from instructors or supervisors	4		
	2. Ability to relate theoretical knowledge with practical applications	4		
	3. Proper use of manuals and interpretation of drawings	4		
	4. Ability to carry out trouble shooting on equipment, (put right mistake in work or finishing)	4		
	5. Ability to service and repair equipment (clean and maintain tools and workplace)	4		
G	General Remarks (other assessment at discretion of assessor)	5		

The assessment shall be carried out as indicated in each area and then the total mark obtained is computed to 50%.

Appendix iii: Industrial Training Assessment Form for Academic

Name of Institution.....				
Name of Industry				
Name of student			Signature.....	
Registration Number				
Name of supervisor			Signature	
Date				
	Area of Assessment	Marks	Score	Area of Improvement
A	Attendance (Was the learner at his work place?)	5		
B	Understanding of tasks	21		
	1. Did the learner provide weekly summary of work performed?	2		
	2. How did the learner describe the tasks performed?	4		
	3. How was the learner able to explain why tasks were being done in a particular way?	3		
	4. How did the learner explain problems experienced when carrying out the work and how they were solved?	3		
	5. How did the learner explain the knowledge and skills acquired at the institute that enabled him to perform?	2		
	6. How did the learner describe the new knowledge and skills gained?	3		
	7. How did the learner explain his relationship with his core workers and supervisors and how he plans to improve or maintain it?	2		
	8. How did the learner relate the industrial training tasks to his training as a technician?	2		
C	General Remarks (Other assessment at discretion of examiner)	4		
Total mark		30		

The assessment shall be carried out as indicated in each area and then the total mark obtained is computed to 30%.

Appendix IV: Field Attachment Report and Guide for Industrial Training

The report should be written in English and contain the following to be assessed as shown:

No	Contents	Maximum Score
1	Cover page: i) Name of institution ii) Name of Department iii) Name of learner and year of study iv) Place of Industrial Training v) Period of Industrial Training e.g. July- September 2015 vi) Academic and Field Supervisor's signatures	1 mark
2	Acknowledgements i) Acknowledge all assistance during field training ii) Acknowledge assistance during report writing	0.5 marks
3	Executive summary or abstract i) To include statement of the most practical work carried out ii) Challenges iii) Conclusions	2 marks
4	Table of contents To show the content of the report and page numbers where they first occur	0.5 marks
5	List of figures i) All figures in the report must have a number and a caption ii) Figures must be numbered according to the chapters where they occur for example; Figure 4.1, to refer to first Figure in chapter 4 iii) The pages where the figures occur must be shown in the list of figures	0.5 marks
6	List of tables i) All tables in the report must have a number and a header ii) Tables must be numbered according to the chapters where they occur for example; Table 2.1, to refer to first table in Chapter 2 iii) The pages where the tables occur must be shown in the list of tables	0.5 marks
7	List of acronyms or abbreviations Acronyms used should be given in alphabetical order with their full meaning shown	0.5 marks
8	Introduction i) Location and description of place of field attachment ii) Objectives of field attachment iii) Structure, organisation iv) Tasks carried out by the place attached to e.g. if District Local Government describe its role in society	2 Marks
9	Main body of the report i) Description of work carried out ii) Duties and responsibilities assigned and how they were carried out iii) Health, safety and security regulations observed during execution of activities iv) New knowledge and skills gained	8 marks

	v) Relationship with other staff and supervisor vi) Problems experienced and how they were handled	
10	Conclusions A brief summary of knowledge gained as outlined in the objectives	1mark
11	Recommendations i) For improving Industrial Training, usually derived from problems experienced ii) For improvement of work output at the place of work (this is included if allowed by the field supervisor)	1.5 marks
12	References i) Design standards and guidelines used during training ii) Books and internet material iii) APA style of referencing shall be used	1.5 marks
13	Appendices i) Drawings ii) Photographs, etc	0.5 marks
Total Mark		20 marks

Appendix V: Tools and Equipment for the Institution

Abrasive cutters	Blue printing machine
Acetylene gas cylinder	Boiler and steam piping instrument (lab. Type)
Adjustable set squares	Bottom flask
Air compressor test set	Box spanners
Air thermometer constant volume	Boyle gas calorimeter
Airline pressure gauge	Brake testing equipment with control panel
Allen keys (set)	Brazing rods
Angle plates	Breast drill (manual)
Anvil and stand	Bubb sponges
Aprons	Callipers (inside and outside)
Arbour press	Carburettor service kit
armature lathe	Carburising equipment
Assorted cutting snips	Centre drills (a set)
Auto bomb calorimeter	Centre lathe with the swing of 330 and length of bed 1500 mm with com plate accessories
Automatic fuel flow meter	Centre punches
Automobile final drive	Chain wrench (for removing oil filter)
Automotive engine test bed	Charge make-up scale (100 kg scale)
Automotive instructional system	Circular saw
Balancing machine	Clamp
Band saw	Clutch testing machine
Battery coil tester	Cold chisels set
Battery tester	Column/pillar drilling machine
Bellows	Combination pliers
Bench grinding machine	Combination set
Bench mounted air-cooled 2 stroke petrol engine rig including dynamometer	Combined portable thermocouple pyrometer
Bench polishing machine	Combined separating and throttling calorimeter
Bench shearing machine	Combined slag lifter and skimming ladle
Bench vice	Complete mechanics tool kit
Bending roller	Compression meter
Black smith forge	Continuous mixer machine dispenser
Black smith hand hammer (various sizes)	Coolant flow meter
Blackboard compasses	Engine mounting stand
Blackboard protractor	Engine sump drainer
Blackboard ruler (1m)	Engineer's square
Blackboard set square (45° 60°) a set of four	Erasing stencils
Blackboard tee squares	Etching machine
Blow lamps	Exhaust emission unit
Core boxes	Exhaust gas analyser
Core driver	Exhaust gas calorimeter
Crankshaft grinder	
Creep testing machine	
Crucible furnace	
Crucible lifting tongs	

Crucible rest or stool	Eye goggles
Cutting pliers	Face shield
Cylinder boring machine	Falling ball viscometer
Cylinder petrol engine	Fatigue tester
Cylinder ridge remover	Feeler gauges
Dedicators	Fire extinguishers, water, foam, dry powder and sand buckets
Degreasing plunger	Flame hardening equipment
Depth gauge	Flash gas lighter
Desk sharpener (5 pieces)	Flash point apparatus
Dial gauge	Flat file second cut
Dial indicator and stand	Flat rough file (300 mm)
Diesel fuel pump test stand	Flat scale rule (300 mm)
Digital tachometer	Flat screw driver
Disc and bobbing sander	Flat smooth file (250 mm)
Dividers	Flatters
Double ended buffer and polisher	Floating body apparatus
Draw pins	Floor mounted tensile/ compression testing machine with accessories
Drawing rack/shelves	Foot operated grease dispenser
Drawing set complete with pens for ink work	Foot operated guillotine machine
Drawing table complete with drafting machine/stood	French curve set
Drift punches (various sizes)	Fuel consumption measurement system
Drill drift	Fuel consumption measuring system
Drill set	Fuller
Dynamometer	G. Clamps
Electric anemometer	Gas bottle keys
Electric furnace with control	Gas cylinder truck
Electric hand drill	Gas laws apparatus
Electric hand grinder/sander	Gate cutter or spoon
Electric vulcaniser	Gloves
Electrode drying oven	Goggles
Electrode holder	Grant gas analyser
Electrolytic tester	Leg vice
Electronic engine indicating equipment	Letter stamps
Engine cooling water system	Letter stencils (3 mm, 6 mm, 7mm and 10 mm)
Engine diagnostic equipment	Lifters
Gravimetric fuel system	Limit gauges (various types)
Grease gun	Lubricating oil test rig
Grinding machine (pedestal type)	Lubrication equipment
Guillotine	Machine reamers (a set)
Hacksaw	Macrohardness testing machine (Brinell, Vickers, and Rockwell)
Half round bastard file	Magnetic base
Half round rough file (150 mm)	Mallets (rubber, wood and rawhide)
Half round smooth file (250 mm)	
Hammers (assorted weight)	

Hand drill	Manometer
Hand reamers (set)	Manual table press (2 pieces)
Hand shear	Marcet boiler
Hand vice	Marking out table
Hardies	Master cylinder test equipment
Head light tester	Measuring and marking out tools
Heading tool	Measuring balls/rollers (sets)
Heat exchanger	Measuring tapes
Heat resistant gloves	Mechanical equivalent of heat apparatus
Heat treatment furnace	Metallurgical microscopes
Heavy duty tyre changer	Micro hardness testing machine
High pressure vapour unit	Micrometre (assorted)
Honing machine	Micrometre screw gauge (metric)
Hot chisels	Micrometres outside 0.25 mm, 25-50 mm, 50-75 mm and sets of inside micrometres
Hydraulic dynamometer	Microscope
Hydraulic jack	Moulding bench
Hydraulic press (100 tonnes)	Moulding flask
Hydraulics bench with accessories for various experiments in fluid flow measurements	Moulding machine
Hydro-meters	Moulding sand shovel
Ignition coil tester	Moulding trowels (various sizes)
Impact testers (Izod, Charpy)	Multipurpose furnace
Induction hardening equipment	Number stamps
Injector pump test bench	Oil can
Injector type HC	Optical pyrometer
Inside calliper	Orifice inlet air meter
Jig saw	Outside calliper
Jointer	Oxygen gas cylinder
Knee leggings (foundry)	Round file
Knurling tools	Round rough file (300 mm)
Laminar flow apparatus	Rubber stencils (3 mm, 6 mm, 7 mm, 6 mm and 10 mm)
Lean/rich mixture device	Safety boots (fire resistant)
Leather apron	Salt bath furnace
Parallel strips (assorted)	Sand and water buckets
Parting machine	Sand mixing machine
Pattern milling machine	Sawing, planning, boring, turning tools
Pedestal grinder	Scrapers (a set)
Pedestal grinder with drill grinding attachment	Screw driver (a set)
Personal computers	Screw extractor (a set)
PH meter	Screw gauges (assorted)
Philips screw driver	Scribers
Pillar drilling machine	Scribing block
Pilot static tube	Sensitive drilling machine
Pin punches	Set of open ended spanners
	Set squares

Piston ring removal	Shaping machining with accessories
Plier (assorted)	Sledge hammer
Plotter	Slip gauges (a set)
Plug gauges (assorted)	Smoke tunnel
Pneumatic tyre removal equipment	Snychroscope (distributor tester)
Polishing machine	Soldering flux
Portable crane	Source rough file (300 mm)
Portable tyre inflator (manual)	Spanners of assorted types and sizes
Portable vehicle hoist	Spark plug tester
Power hacksaw	Specimen mounting screen
Pressure cooker	Speedomax recorder
Printer to handle A3 size paper	Sprue pins
Profile cutting machine	Standard service pit
Protection screen for five booths for both arc and gas	Steam boiler plant (laboratory type)
Pullers (various sizes)	Steam cleaner
Punches (cold)	Steel rule 150mm
PV diagram function generator	Steel rule 300mm
Pyrometer, infrared, non-contact digital infrastructure	Steering geometry measuring device
Quenching bath	Stocks and dies (set) metric
Radial drilling machine complete with accessories (optional)	Stools
Radius gauges (assorted)	Straight shank drill bits
Ram - up to 6 tons capacity	Universal tool and cutter grinder
Rammers (various types)	Valve grinder
Resistance thermometer	Valve reface
Rivet gun	Vapour density apparatus
Rota meter	Valve reface
Rota meter	Vee-block and clamp
Rotary viscometer	Vee-block with clamps
Strain gauge	Vent rods
Strike-off-bars	Vernier calliper
Stroboscope	Vernier callipers (various sizes)
Stroke diesel engine	Vernier height gauge
Surface grinding machine complete with accessories	Vernier protractor
Surface plate	Vibration meter
Swage block	Wallets of warding files
Swing beam folder	Water meter
Table top tensometer with accessories	Watering can
Tachometer	Wear and friction bearing test apparatus
Tap extractor set	Weir tank (impact on jet, orifice)
Tapered shank drill bits	Welding and cutting burner set
Taps and wrenches (set) metric	Welding chipping hammer
Test rig for electric fuel injector (petrol)	Welding shield
	Welding table (arc)
	Welding transformer
	Wet brush

Thermal anemometer	Wheel alignment equipment
Thermal conductivity apparatus	Wheel balancing equipment (dynamic type)
Thermocouples	Wheel dresser
Thread chaser (assorted)	Wheelbarrow
Tongs (assorted)	Wire brush (bench type)
Tool room lathe with the swing of 483 and length of bed 200 mm with complete accessories	Wood plan-machine
Top and bottom swage (various sizes)	Work benches
Torsion tester	Workshop service compressor
Transparent engine, gear boxes (for demonstration)	Woodworking lathe
Triangular file	X-Y recorder for tensile tester
Triangular scale rule (30 mm)	
Triangular smooth file (150 mm)	
Trolley jacks	
Try-square	
Twist drill sets	
Tyre repair kit	
Un-calibrated mercury in glass thermometer 10° to 110°c	
Universal battery charger	
Universal milling machine complete with accessories	

Appendix VI: Bibliography

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