



NATIONAL CERTIFICATE IN AUTOMOTIVE MECHANICS (NCAM)



**SYLLABUS
FOR
TECHNICAL AND VOCATIONAL INSTITUTES
THE REPUBLIC OF UGANDA**



Ministry of Education Science Technology and Sports

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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 producing technicians in the country among others. The Government of Uganda aims at providing technical, scientific and vocational skills for the 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 Automotive Mechanics perform. This led to the development of all modules in this curriculum.

This curriculum is updated with current labour market demands and its 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
AIDS	Acquired Immune Deficiency Syndrome
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-
LCM	Lowest Common Multiple
MoESTS	Ministry of Education Science Technology and Sports
MoH	Ministry of Health
MoLGSD	Ministry of Labour Gender and Social Development
NCAM	National Certificate in Automotive Mechanics
NCDC	National Curriculum Development Centre
NCHE	National Council for Higher Education
NCMF	National Certificate in Machining and Fitting
NDME	National Diploma in Mechanical 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

RTI	Research Triangle International
SACCO	Savings And Credit Co-operative
SHE	Safety Health 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
TCTM	Technical Certificate Course module code for Applied Technicians Mathematics
TCCS	Technical Certificate Course module code for Communication Skills
TCCA	Technical Certificate Course module code for Computer Applications
TCBE	Technical Certificate Course module code for Business Entrepreneurship Skills
TCHY	Total Contact Hours per Year
TCFM	Technical Certificate Course module code for Fitting and Machining core modules
TCAM	Technical Certificate Course module code for Automotive Mechanics core modules
TH	Training Hours
TS	Technical School
TI	Technical Institute
UBTEB	Uganda Business and Technical Examinations Board
UNAIDS	The Joint United Nations Programme 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 Automotive Mechanics (NCAM) curriculum is aimed at producing Automotive Mechanics who are relevant to the industry and world of work. It is learner-centred and competence-based. It emphasizes acquisition of skills by the learners, through practical teaching and execution of projects.

The curriculum is emanated from the BTVET Act (2008), the strategic plan of "Skilling Uganda" and Uganda Vision 2040.

The competences that the learner is 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 attain particular skills required for performing tasks at any 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: Automotive Technology and Maintenance, Motor Vehicle Electrical Technology and Maintenance, Technician Science, Technical Drawing, Automotive Electric and Electronics practice, and Real Life Project are aimed at equipping the learner with the core hands-on skills and techniques in the field of motor vehicle and mechanical engineering.

Applied Technician's Mathematics module is aimed at improving the learner's ability to judge and 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, profitably 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 the world of work.

This curriculum, if implemented, should produce automotive mechanics who are able to:

- i) fabricate components and machine parts
- ii) maintain engines to good working condition
- iii) maintain the transmission and suspension systems of a vehicle
- iv) install, repair and maintain the electrical/electronic systems in a vehicle
- v) prepare reports, budgets, and operation plans
- vi) promote and ensure the safety of workers and plant
- vii) initiate and manage small Business Enterprises

Guidelines for Implementing the NCAM Curriculum

Title of the course

The title of the course is National Certificate in Automotive Mechanics (**NCAM**)

Duration of the Course

The National Certificate in Automotive Mechanics is a full time course taught in **two** academic years.

Each academic year consists of **three** terms. Terms one and two consists 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** weeks, which comprise of **eight** 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 each academic 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 Automotive Mechanics course on meeting any of the following minimum qualifications:

a) Uganda Certificate of Education entry scheme

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 Automotive Mechanics

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

- (i) Mechanical Engineering
- (ii) Refrigeration and Air-Conditioning
- (iii) Water Engineering
- (iv) Information and Communication Technology
- (v) Automotive Engineering
- (vi) Electrical Engineering.
- (vii) Agricultural Mechanisation and any other related course/ programme

Awards

- A learner who completes the course with at least 2.0 Cumulative Grade Point Average (CGPA) shall be awarded a **classified "National Certificate in Automotive"** by the mandated examining body.
- A learner who does not attain at least 2.0 GPA but acquires competences in some modules of the course shall be awarded a **Competency class Certificate in Automotive** by the 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 specialized field and the world of work.
- A candidate shall be considered to have acquired a competence on performing tasks required in the labour market and must have attended at **least 75%** of the course and undergone both continuous assessment and end of academic year examinations.
- A candidate will not be considered to have acquired a competence on failure to perform tasks required in the labour market. A candidate who does not attend at **least 75%** of the course, undergo continuous assessment and sit end of academic year examinations, shall NOT be awarded a competence certificate.
- Continuous assessment shall be handled by training institutions and verified by the mandated examining body.
- 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

A mandated Examinations Body will assess the NCAM; 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 sessions 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 assessment body 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 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
• <u>Final report on project and Presentation</u>	<u>15 marks</u>
<u>Total</u>	<u>100 marks</u>

(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 consists of:**
 - Class work
 - Written questions to be answered from home(Home work)
 - Reports from attended industrial visits, documentaries, field visits and presentations by professionals
 - Practical execution and participation

The modules without practical work such as; TCTM 101 Applied Technicians Mathematics I and TCTM 201: Applied Technicians Mathematics II, will have continuous assessment as follows;

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

The modules with practical work such as life Skills TCCS 101, Basic Kiswahili TCCS 201, Computer applications TCCA 101, Entrepreneurship Skills TCBE 201, Automotive Technology and Maintenance I TCAM 101, Automotive Technology and Maintenance II TCAM 201, Motor Vehicle Electric and Electronic Practice ITCAM 102, Automotive Electric and Electronics Practice II TCAM 202, Technician Science I TCAM103, Technician Science II TCAM 203, Technical Drawing ITCAM 104 and Technical Drawing IITCAM 204 will have continuous assessment.

• Assignments	10 marks
• Tests	05 marks
• Practical work	25 marks
Total	40 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

60%

Depending on the respective examination 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 endeavour 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 organisation, 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:

- i) An industrial supervisor who will 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.
- ii) 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 supervisor's 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 assessment 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 15 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 and assessment hour (FVAH) 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 according to the Cumulative Grade Point Average (CGPA) score. The final marks for a module shall be converted into Grade Point (GP) as follows:

% Marks	Letter 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 Automotive Mechanics 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

Retaking a Module

- i) A learner may retake a given module to improve grades. Retaking means repeating the entire module, that is; attending lessons, doing continuous assessments and the final examination. 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 each 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 s/he 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

Year 1	
Paper Name and Code	Examination Format
TCAM101: Automotive Technology and Maintenance I	The paper shall consist of two compulsory sections A and B. Section A shall consist of six short answer written questions carrying 5 marks each . Section B shall consist of two compulsory practical questions carrying 35 marks each. Section A shall take a duration of one hour and the candidate shall be required to immediately proceed with section B that shall take a duration of two hours . The assessment body shall send a practical examiner on site to award the candidates the marks as they perform the required tasks in section B. The answer scripts for section A shall be sealed in an envelope and sent to the assessment body for marking. A cutting list shall be sent to the training institution by the examining body to enable earlier preparations. The questioning techniques to be applied should seek for the candidates' ability to comprehend, apply, analyse, synthesise and evaluate conditions. The total duration of the examination shall be Three (3) hours.
TCAM 102: Automotive Electric and Electronics Practice	The paper shall consist of Six questions of practical nature 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 comprehend, apply, analyse, synthesise and evaluate conditions. The total duration of the examination shall be three hours.
TCAM 103; Technician Science I TCTM 101: Applied Technician Mathematics I TCCS 101: Life skills	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.
TCAM -104:Technical Drawing I	The paper shall consist of two sections: A [Geometry and plane figures] and B [Orthographic, Auxiliary, Sectioning and Isometric]. Section A shall consist of three questions and candidates shall answer any two questions, each carrying 20 marks. Section B shall consist of two questions and the candidate will be required to answer only one question; each question in Section B shall carry 60 marks. The total duration of the examination shall be three hours.
TCCA 101: Computer Application	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, analyse, synthesise

	and evaluate conditions. The duration of this examination shall be two hours.
TCAM105: Real Life Project 1	The real life project shall consists of continuous assessment marks. The Examinations Board should 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 candidate's ability to, comprehend, apply, analyse, synthesise and evaluate conditions The duration of the project assessment shall be the period during the 28 weeks of teaching in an academic year of study.

YEAR 2

Paper Name and Code	Examination Format
TCAM 201: Automotive Technology and Maintenance II	The paper shall consist of six questions of practical nature 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 comprehend, apply, analyse, synthesise and evaluate conditions. The total duration of the examination shall be three hours.
TCAM 202; Automotive Electric and	The paper shall consist of two compulsory sections A and B . Section

Electronics Practice	A shall consist of Six short answer written questions carrying 5 marks each . Section B shall consist of Two compulsory practical questions carrying 35 marks each. Section A shall take a duration of One hour and the candidate shall be required to immediately proceed with section B that shall take a duration of Two hours . The assessment body shall send a practical examiner on site to award the candidates the marks as they perform the required tasks in section B. The answer scripts for section A shall be sealed in an envelope and sent to the assessment body for marking. A cutting list shall be sent to the training institution by the examining body to enable earlier preparations. The questioning techniques to be applied should seek for the candidates' ability to comprehend, apply, analyse, synthesise and evaluate conditions. The total duration of the examination shall be Three (3) hours.
TCAM 203; Technician Science II TCTM 201: Applied Technician Mathematics II TCBE 201: Entrepreneurship Skills	The paper shall consist of eight questions and the candidate is required to answer any five. All questions shall carry equal marks. The questioning techniques shall seek for the candidates' ability to remember, comprehend, apply, analyse, synthesise and evaluate conditions. Duration shall be three

	hours.
TCAM 204: Technical Drawing II	The paper shall consist of two sections: A [Geometry and plane figures] and B [Orthographic, Auxiliary, Sectioning and Isometric]. Section A shall consist of three questions and the candidates shall answer any two questions, each carrying 20 marks. Section B shall consist of two questions and the candidate is required to answer only one question, each question in section B carries 60 marks. The total duration of the examination is three hours The questioning techniques to be applied should seek for the candidate's ability to comprehend, apply, analyse, synthesise and evaluate conditions
TCCS 201: Basic Kiswahili	The paper shall consist of two sections A (general Kiswahili) and B (professional). Section A shall consist of five questions and a candidate shall be required to answer any three questions. Section B shall consist of three questions and a candidate is required to answer any two. All questions 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. The total duration of the examination shall be Three hours.
TCAM 205: Real Life Project II	The paper shall consist of continuous assessment marks. The Examinations Board should 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 candidate's ability to, comprehend, apply, analyse, synthesise and evaluate conditions The duration of the project assessment shall be the period during the 28 weeks of teaching in an academic year of study.
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Focus of Education

The focus of education for NCAM 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 be either 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 theoretical 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 , 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 Course
- 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 moral conduct
- iv) Offer guidance and counselling to learners
- v) Manage resources
- vi) Ensure security of learners and the 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 Institution 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

Effective Learning Environment

For successful implementation of NCAM, 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 cooks and 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 there :

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

Professional Profile for NCAM

This section describes the professional profile of the National Certificate in Automotive Mechanics (NCAM).

Job Titles and Tasks of NCAM

The main duties and tasks performed by graduates of the National Certificate in Automotive Mechanics include the following:

Job Title	Duties / Tasks
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Motor Vehicle Mechanic	• Carries out vehicle inspections, maintenance and repairs as prescribed by the vehicle manufacturers • Carries out the maintenance of tools/ equipment in the workshops • Welds vehicle components • Panel beats, re-sprays and refinishes vehicle bodies • Vehicle body building and reconstruction • Performs workshop and laboratory tests • Performs fault diagnosis on vehicles and generators • Investigates performance of vehicle systems
Vehicle Inspector	• Establishes vehicle inspection centre • Carries out pre- and post- repair inspections for government, private sector, corporation, individual and diplomats vehicles • Carries out periodic vehicle inspection for road worthiness • Prepares and keeps record of technical report for inspected vehicles
Motor Vehicle Technical Writer	• Publishes in newspapers, journals and internet information regarding vehicles • Provides technical written advice on problems established in the motor industry • Advertises for vehicle manufacturers and dealers
Automotive Operator	• Works as vehicle drivers • Carries out daily checks on the equipment • Observes safety measures during operation • Operates and maintains heavy construction equipment • Prepares report on operation and maintenance of equipment • Keeps maintenance records of equipment

Job Title	Duties / Tasks
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 • Initiates and manages small business enterprises • Manages workshop records • Tests materials used in plumbing • Leads subordinates • Prepares and carries out welding procedures • Upholds and promotes safety standards

Organisations that Employ (NCAM) Graduates

A graduate of NCAM may be employed in the following organisations:

- i) Manufacturing / processing industries both in the private and public sector
- ii) Service sectors like water distribution, sewerage, oil and gas, steam, engineering services/ boards, corporations, and institutions
- iii) Construction companies, Public works department and rural development agencies
- iv) Power generation, transmission and construction projects
- v) Self-employment in manufacturing and service sectors
- vi) Technicians in educational Institutions

Core Tasks for NCAM

The core tasks are characterised as follows:

Core Task 1: To Fabricate Components and Machine Parts	
Results	Fabricated and well-assembled components (products)
Working Environment	Industries, workshops, site, power house
Level of Complexity	Fabrication of simple components/products
Performance Indicators	- Functional marketable components/parts - Client satisfaction - Compliance with safety standards - Realistic / Affordable/ Economic design
Methods and Tools used in performing professional tasks	Tasks/Activities - Selection of materials - Sketching, drawing and animation - Fabrication - Joining - Forming processes Tools and Equipment - Casting tools - Measuring equipment - Guides and manuals - Computers and drawing equipment - Testing equipment

Core Task 2: To Maintain Engines to Good Working Condition	
Results	Engine in good working condition to comply with Standards

working Environment	Power plants, workshops, sites, garage
Level of complexity	- Assessing and trouble shooting of faults and defects - Interpretation and usage of manuals - Disassembly and assembly of engines - Scheduled servicing and repairs
Performance Indicators	- Client satisfaction - Compliance with safety standards - Well drawn and followed work plan - Completion in time and within costs
Methods and Tools used in performing professional tasks	Tasks/Activities - Testing and approval of engine performance - Selection of tools - Evaluation of work progress - Cost analysis - Application of computer knowledge - Compiled reports and documentation Tools and Equipment - Guides and manuals - Testing equipment and kits - Conventional and non-conventional machines - Measuring equipment - Computers

Core Task 3: To Maintain the Transmission and Suspension Systems of a Vehicle

Results	Transmission and suspension systems in good working conditions to comply with standard
Working Environment	Industries, garages, workshops, sites
Level of Complexity	- Assessing and trouble shooting of faults and defects - Interpretation and usage of manuals - Disassembly and assembly of transmission and suspension system
Performance Indicators	- Client satisfaction - Compliance with safety standards - Well drawn and followed work plan - Completion in time and within costs - Compiled reports and documentation
Methods and Tools used in performing professional tasks	Tasks/Activities - Testing and approval of transmission and suspension system. - Evaluation of work progress and performance of transmission and suspension system. - Cost analysis

Core Task 4: To Install, Repair and Maintain the Electrical/Electronic Systems in a Vehicle		
Results	Electrical/electronic systems in good working conditions	
Working Environment	Garages, Workshops, sites	
Level of Complexity	- Assessing and trouble shooting of faults and defects - Interpretation and usage of manuals - Installation of wiring of a vehicle	
Performance indicators	- Client, consultant and contractor satisfaction - Compliance with safety and health standards - Availability and reliability of equipment - Sustainable maintenance	
Methods and Tools used in performing professional tasks	Tasks/Activities - Testing and approval of machines and equipment - Evaluation of work progress and performance of machines and equipment - Cost analysis - Application of computer knowledge - Scheduled servicing and repairs Tools and equipment - Manuals - Testing equipment and kits - Computer - Safety standards	
		- Application of computer knowledge - Scheduled servicing and repairs Tools and Equipment - Manuals - Testing equipment and kits - Tools for maintenance - Computer - Safety standards

Core Task 5: To Prepare Reports, Budgets and Operation Plans		
Results	Well prepared reports, budgets and operation plans	
Working Environment	Industries, workshops, construction sites	
Level of Complexity	Daily, weekly, monthly and annual reports, budgets and operation plans	
Performance indicators	- Availability of project progress reports - Availability of budgets, work and procurement plans - Availability of attendance, work schedule wage payment sheets - Compliance with safety and health standards - Timely and right decision making	
Methods and Tools used in performing professional tasks	Tasks/Activities - Data collection and compilation - Analysis of financial requirement/needs	

	• Referencing Tools and equipment • Forecasting and assessing operation plans • Computer and stationery • Planning soft ware • Books of accounts
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Core Task 6: To Promote and Ensure Safety of Workers and Plant	
Results	Safe working environment
Working Environment	Industries, Workshops, sites
Level of complexity	Housekeeping and General workplace Safety standards
Performance indicators	• Client satisfaction • Compliance with safety standards • Reduced number of accidents and breakdowns
Methods and Tools used in performing professional tasks	Tasks/Activities • Sensitisation of workers • Training on safety standards • Use of safety charts and tags Tools and equipment • Manuals • Safety standards

Core Task 7: To Initiate and Manage Small Business Enterprises	
Results/outputs	Well managed and profit making business
Working environment	Workshops, hardware shops, fabrication construction sites, self-started enterprise and firms
Level of complexity	Small and medium scale enterprises
Performance indicators	• Profit making • Satisfaction of customers and all parties involved • Smooth running of business activities
Methods, equipment and facilities used in performing professional tasks	Tasks/Activities • SWOT analysis and Scanning the environment • Copying from existing businesses • Creativity • Responding to the environmental needs • Market research • Costing/pricing • Advertising/ promotion Facilities and equipment • Business plan • Computer and stationery • Tender documents

Course structure

Year 1 (All Modules are Core)		TCHY	NWY	CU
TCTM 101	Applied Technician Mathematics I	112	28	4
TCCS 101	Life skills	56	28	2
TCCA 101	Computer Applications	112	28	4
TCAM 101	Automotive Technology and Maintenance I	140	28	5
TCAM 102	Automotive Electric and Electronics Practice I	84	28	3
TCAM 103	Technician Science I	112	28	4
TCAM 104	Technical Drawing I	112	28	4
TCAM105	Real Life Project I	112	28	4
TOTAL PER YEAR		840		30
RECESS TERM				
TCAM 111	INDUSTRIAL TRAINING I	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
TCAM 201	Automotive Technology and Maintenance II	140	28	5
TCAM 202	Automotive Electric and Electronics Practice II	112	28	4
TCAM 203	Technician Science II	84	28	3
TCAM 204	Technical Drawing II	84	28	3
TCAM205	Real Life Project II	112	28	4
TOTAL PER YEAR		784		28
RECESS TERM				
TCAM 211	INDUSTRIAL TRAINING	288	6	5

TCHY : Total Contact Hours per Year

NWY : Number of Weeks per Year

CU : Credit Units = (TCHY / NWY)

Detailed Description of Year I Term I

TCTM 101: Applied Technician Mathematics I

Duration: 40 Hours

Module Overview

This module is designed to enable the learners attain some mathematical skills that will enable them carry out measurements and estimation. It introduces learners to calculation of cost of materials, solving problems related to fractions, decimals, percentages, ratios and proportions, areas and volumes of different figures and application of 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 materials
- calculate areas and volumes of various objects.

Competences

The learner:

- converts millimetres to metres, kilograms to Newtons and tonnes.
- calculates numbers involving HCM and LCM.
- applies percentages in calculating material costs.
- determines areas of irregular objects using Simpson, mid ordinate and trapezoidal rules.

- interprets the drawings by taking scale rule measurements. - costs timber using the areas and volume calculation methods. - applies the laws of indices in solving indicial equations. - rationalises and manipulates indicial equations. - evaluates logarithms	
Detailed Module Description	Duration
Sub-module 1: Basic SI Units and Arithmetic Algebra - Metric conversion of SI Units - Fractions(L.C.M and H.C.M) and decimals - Percentages, Ratios and proportions	08 Hours
Sub-module 2: Mensuration - Calculation of area, perimeter, volume and total surface area - Interpretation of given drawing/diagrams - Cost calculations in relation to areas and volumes - 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 - Indicial equation - Multiplication and division of indices, - Rationalisation and equations involving indices. - Rules of logarithms, - Common logarithms, change of base - Equations involving logarithmic functions, exponential functions and logarithmic graphs - Natural logarithms	20 Hours

TCCS 101: Life skills

Duration: 20 Hours

Module Overview

The module equips the learner with skills applied in day-to-day interactions, writing; application letters, Curriculum Vitae (CV) and Minutes. It also helps in technical communications, note taking and gives 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 work place.
- Writes personal Curriculum vitae (CVs), field report, memos, delegation letters, claim letters, stake holders circulars, demand notices.
- Prepares work shop paper for presentation
- Writes suitable adverts and announcements
- gives an account of the origin and history, prevalence rates and current trends of HIV and AIDS in Uganda.
- outlines some HIV/AIDS 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 • Conducting meetings and interviews • Interpersonal skills • Work place communication	6 Hours
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 misconceptions 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 learners with computer skills of typesetting reports and other documents, enable the use of internet for searching required data, 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, external speakers. • removes and replaces computer components • identifies and uses key board buttons as per their functions. • identifies letter and numerical buttons on key board. • typesets data into the computer using key board. • opens, closes, restarts and changes user accounts. • Ensures safety and security of a computer • describes computer operating system, types and 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 maximizing and minimizing to task pane. • copies files from external drive, CD, DVD, flash disc to the computer . • identifies icons and their application. • starts, creates or opens a word window, work with text and manage 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 • 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	6 Hours

• Installation of windows operating system and application software	
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

TCAM 101: Automotive Technology and Maintenance I Duration: 50 Hours
Module Overview The module equips learners with the skills of trouble shooting faults, repairing and maintaining vehicle to good working condition.
Learning Outcome By the end of this module, the learner should be able to practice workshop safety and regulations ,identify fitting and holding tools, apply various methods of joining materials, locate parts of vehicle layout, identify parts of engine systems, and describe the construction , troubleshoot faults, repair and maintain the transmission system of a vehicle .
Competences The learner: • Describes workshop safety and regulation and observes it in the work processes. • Identifies fitting and holding tools and selects them according their use during repair and fabrication. • applies various methods of joining materials. • locates the main parts of conventional vehicle layout and maintains them to their normal function. • locates the main parts of engine systems and maintains them to their function. • describes the construction of transmission system and trouble shoots, repairs and maintains the main

parts.	
Ensures Health , safety and security of vehicle and its environment.	
Detailed Module Description	Duration
Sub-module 1: Workshop Safety and Regulation - Workshop regulations, precautions and hazards; Behavior while in the workshop, - Lifting of heavy loads in the workshop - How to deal with hazards and incidents like fire, electric shocks, fumes and gases - First aid in the workshop, factories and sites - Organization of the workshop	4 Hours
Sub-module 2: Fitting and Holding Tools - Files - Scrapers - Hacksaws - Chisels - Hammers - Punches - Vices - Health , safety and security of fitting and holding tools.	4 Hours
Sub-module 3: Methods of Joining Materials - Rivets and riveting - Rebates and rebating - Bolts and nuts - Adhesive bonding - Locking devices - Health , safety and security of joining materials .	6 Hours
Sub-module 4: Conventional Vehicle Layout - Arrangement of vehicle components - Body and chassis design for motor vehicles - Body and chassis design for motor cycles - Maintenance of the suspension system - Health , safety and security observed in design of vehicle layout	6 Hours
Sub-module 5 : Engine - Types of engines - Engine construction - Engine cycles of operation - Health , safety and security of vehicle and engine.	06 Hours
Sub-module 6 : Engine Systems - Fuel supply system - Cooling system - Lubrication system - Repair and maintenance of the engine systems - Health , safety and security of vehicle and engine systems	16 Hours
Sub-module 7 Transmission System	8 Hours

• Clutch system • Gearbox system • Repair and maintenance • Health , safety and security of vehicle and Transmission System	
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TCAM 102: Automotive Electric and Electronics Practice I

Duration: 30 Hours

Module Overview

The module;

- enables learners to troubleshoot electrical faults, repair and maintain the electrical components of the vehicle.
- introduces the learners to the concept of Motor vehicle electrical technology and practice.

Learning Outcomes

By the end of this module, the learner should be able to describe the principles of electricity, calibrate electrical instruments and their safety , prepare electrolyte for battery, describe the construction and operation of the Conventional Ignition System, its timing and maintenance.

Competences

The learner:

- describes the principles of electricity and terms used.
- calibrates electrical instruments and observes safety against hazards of electricity.
- prepares electrolyte for battery and determines the period required for charging a battery at low voltage.
- describes the construction and operation of the Conventional Ignition System.
- carries out ignition timing and maintains the ignition system.
- Ensures Health , safety and security of vehicle and its surrounding.

Detailed Module Description	Duration
Sub-module 1: Fundamental of Electricity • Principles of electricity • Protection against hazards of electricity • Measurements and measuring instruments	4 Hours
Sub-module 2: Battery • Battery structure and electrolyte • Preparation of electrolytes • Electro chemical process in battery • Construction design of battery • Maintenance of batteries • Health , safety and security of environment during battery maintenance	14 Hours
Sub-module 3: Conventional Ignition System • Centrifugal advance and vacuum control • Multi-stage ignition • Ignition distributor • Spark plugs • Ignition timing and repair • Health , safety and security of vehicle and Ignition system	12 Hours

TCAM 103: Technician Science I

Duration: 40 Hours

Module Overview

The module equips learners with the skill of analysing the effect of forces on engineering materials used in the sizing of materials for production.

Learning Outcome

By the end of this module, the learner should be able to analyse the effect of forces on engineering materials used in the sizing of materials for production.

Competences

The learner:

- resolves forces and determines the resultant of concurrent forces and determines moments at a section of a beam.
- determines work, power and energy possessed by moving vehicle.
- calculates the stress and strain of a loaded material and determines the modulus of elasticity.

Detailed Module Description

Duration

Sub-module 1: Forces and Moments

20 Hours

- Types of forces
- Triangle of forces
- Bow's notation
- Resolution of forces
- Principle of moments
- Levers
- Toque
- Reaction of support
- Centre of gravity

Sub-module 2: Work, Power and Energy

10 Hours

- Force and distance
- Work input
- Work output
- Work done in rotation
- Power
- potential and kinetic energy

Sub-module 3: Stress and Strain

10 Hours

- Types of stress and strain
- Young's modules of elasticity and Hooke's law
- Modulus of rigidity

TCAM 104: Technical Drawing I

Duration: 40 Hours

Module Overview

This module equips the learner with the skill of reading, interpreting, and producing working drawings.

Learning Outcome

By the end of this module, the learner should be able to read, interpret, and produce working drawings.

Competences

The learner:

- uses engineering drawing as a means of representation and communication.
- applies lettering techniques for labeling and dimensioning.
- constructs perpendicular and parallel lines.
- constructs a triangle and inscribes, describes and circumscribes circles to it.
- draws an arc touching a straight line and an arc touching another arc internally and externally.
- constructs external and internal tangents to equal and unequal circles.
- constructs to scale: triangles, quadrilaterals, rectangles, squares, rhombus, trapezium, regular and irregular polygons.

constructs to scale circles with different properties.

Detailed Module Description

Duration

Sub-module I: Introduction to Engineering Drawing

- Aims and purpose of engineering drawing
- Use of drawing equipment (drawing board, drawing set, set squares, tee-square, scale rule, French curves and Flexible rod
- Types and sizes of drawing boards, drawing papers, tee squares i.e. (A0, A1 A2, A3,A4)
- Drawing paper layout: types of title blocks and their application
- Types of lines and their application
- Lettering a drawing- printing styles

8 Hours

Sub-module 2: Geometrical Constructions

- Construction of perpendicular and parallel lines
- Construction of angles by bisection
- Bisection of a line, division of a line into equal parts and given ratios
- Inscribed, described and circumscribing circles
- Determining the centre of circular arc/circle
- determining circumference of circle graphically

10 Hours

Sub-module 3: Simple Geometrical Plane Figures

- Construction of simple plane figures (triangles, rectangles, squares, trapezium, rhombus and other regular and irregular polygons to scale
- The circle and its properties

12 Hours

Sub-module 4: Principles of Tangency

10 Hours

- | | |
|--|--|
| <ul style="list-style-type: none">• Arc to straight line• Arc to Arc externally• Arc to Arc internally• Construction of external and internal tangents to equal and unequal circles | |
|--|--|

TCAM 105: Real Life Project I

Duration: 40 Hours

Module Overview

- This module equips the learner with practical skills in fabrication, drawings, forming/machining, joining, fitting, finishing and assembly of various engineering components.
- The project equips the learner with practical skills in analysing design requirements, selection of materials, assembling of functioning systems, selecting troubleshooting methods, dismantling and assembling machine parts to their proper functioning.

Learning Outcomes

By the end of this module, the learner should be able to correctly

- draw, form/machine, fabricate, join, fit, finish and assemble various components.
- analyse designs, select materials, assemble functioning systems, select troubleshooting methods, dismantle and assemble machine parts to their proper functioning.
- observe health and safety and ensure security of the equipment during execution of project activities.

Competences:

The learner:

- 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 dieing.
- carries out heat treatment of machine parts.
- prepares and interprets engineering drawings.
- identifies materials and tools.
- innovates and modifies components.
- selects the troubleshooting methods to identify the faults.
- interprets the operation manuals.
- identifies materials and consumables.
- selects the tools and components.
- dismantles and assembles machine parts.
- sustains constant maintenance of the unit.
- tests and operates the transmission system.
- costs and quantifies materials.
- assembles components.
- tests the machine.
- prepares project reports.

Detailed Project Description

Duration

Suggested Projects :

- fabricate casement hinge
- fabricate round charcoal stove using rivets
- fabricate waste disposal units
- fabricate axle stand
- fabricate vehicle seat stand
- fabricate vehicle rack
- Repair tyres

40 Hours

- | | |
|--|--|
| <ul style="list-style-type: none"> • alignment wheel s • spray / re-spray vehicle body • Tool box • Dust pan • Spanner • G-clamp • Screw jack • Gear box final drive overhaul • Design and wire on aboard a conventional lighting circuit | |
|--|--|

NOTE: *The project(s) should be completed by the end of first year*

Detailed Description of Year 1 Term II

TCTM 101: Applied Technician Mathematics I

Duration: 40 Hours

Module Overview

The module introduces the learner to trigonometry, matrices and their application in construction and engineering. It equips the learner with trigonometry skills and knowledge used for calculating materials for roofs, setting out structures and templates.

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 learners improve on their discourse writing skills, prepare and make presentations, and 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 • Class room report preparation and assessment presentations • Public document preparation and presentations	6 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

The module is intended to help learners carry out printing, scanning of documents and the use of internet.

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

4 Hours

Sub-module 6 : Internet and e-mail

- The Internet, web Browsers
- Opening a websites; 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 email attachment from incoming email - Formatting mail - Searching mail - Printing mail • Health ,Safety and Security 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

TTCAM 101: Automotive Technology and Maintenance I Duration: 50 Hours	
Module Overview The module equips learners with the skill of trouble shooting the faults, repairing and maintaining vehicle to good working condition.	
Learning Outcome By the end of this module, the learner should be able to mark out, measure, explain types of suspension systems , trouble shoot faults, repair and maintain the vehicle to good working condition.	
Competences The learner: • identifies the various types of marking out tools and selects them for use during marking out. • selects the various Workshop measuring instrument for use according their function. • applies the various methods of cutting screw threads. • locates the main components of the drive train and maintains them to their normal function. • identifies the main components of the suspension system, services and maintains the suspension system. • describes the operation of the steering system and maintains the steering system components. • Ensures health, safety and security of the vehicle and its environment.	
Detailed Module Description	Duration
Sub-module 8: Marking out Marking out Tools • Steel rule, Squares, Dividers • Hand scribe, Scribing block and surface gauge • Angle plate	8 Hours

• V-blocks • Parallel strips or block • Spirit levels • Surface plate	
Sub- module 9: Workshop Measuring Instrument • Micrometer • Vernier calliper • English micrometer • Vernier in English system • Health , safety and security of measuring instruments.	6 Hours
Sub- module 10: Screw Thread and Screw Cutting • Types of threads • Methods of forming screw threads • Health , safety and security of environment when threading and cutting screws .	6 Hours
Sub -module 11: Drive Train • Universal joints and propeller shaft • Final drive • Drive axles • Servicing and maintenance of final drive. • Health , safety and security of vehicle and drive train .	10 Hours
Sub- module 12: Suspension Systems • Types of suspension system and their operations: - beam axle suspension - independent suspension • Wheels and types • Servicing and maintenance of suspension system • Health , safety and security of vehicle and suspension system.	10 Hours
Sub- module 13: Steering System • Principle of steering system • Steering geometry • Types of steering systems • Steering system components • Servicing and maintenance of steering system components • Health , safety and security of vehicle and steering system	10 Hours

TCAM102: Automotive Electric and Electronics Practice I Duration: 30 Hours	
Module Overview The module enables learners to troubleshoot electrical faults, repair and maintain the electrical components of the vehicle. The module introduces the learner to the auto, electrical and electronic systems.	
Learning Outcomes By the end of this module, the learner should be able to identify the various parts of the Ignition and starting systems, describe the construction and operation of charging system, service and maintain the lighting systems of a vehicle.	
Competences The learner: - identifies the various parts of the Ignition and starting systems and maintains the main components. - describes the construction and operation of Ignition and charging system, repairs and maintains the main components of the Ignition and charging system. - services and maintains the lighting systems of a vehicle. - Ensures Health, safety and security of vehicle and its environment.	
Detailed Module Description	Duration
Sub-module 4: Starting System - Starter motor circuit - Starter engagement with engine - Axial and co-axial starter motors - Ignition system - Health, safety and security of environment when servicing the starting system.	10 Hours
Sub-module 5: Charging System - Principles of charging system - Lay-out of charging system and operation - Alternator construction and operation - Rectification of AC currents - Charging system regulators - Health, safety and security of vehicle and charging system	12 Hours
Sub-module 6: Lighting System - Circuit arrangements - Filament lamps - Auxiliary lighting and equipment - Health, safety and security of vehicle and lighting system.	8 Hours

TCAM 103: Technician Science I

Duration: 40 Hours

Module Overview

The module equips learners with the skill of analysing the effect of force and heat on engineering materials as used in the sizing of materials for production.

Learning Outcome

By the end of this module, the learner should be able to analyze the effect of heat on engineering materials and the relationship between velocity, acceleration and braking efficiency in the sizing of materials for production.

Competences

The learner:

- calculates heat energy transfer and the related effect on the materials.
- describes the application of latent heat in industry.
- determines the velocity, acceleration and braking efficiency of a vehicle.
- applies displacement formulae to solve problems related to displacement.

Detailed Module Description

Duration

Sub-module 4: Temperature and Heat

22 Hours

- Measurement of heat and temperature
- Specific heat capacity
- Latent and sensible heat
- Heat transfer
- Calorific value of heat
- Coefficient of expansion

Sub-module 5: Velocity, Acceleration and Braking Efficiency

18 Hours

- Speed and velocity
- Relationship between distance, velocity, acceleration and time
- Braking efficiency

TCAM 104: Technical Drawing 1

Duration: 40 Hours

Module Overview

The module equips learners with the skill of interpreting and drawing various engineering parts which is used as communication medium for production of engineering parts.

Learning Outcome

By the end of this module the learner should be able to interpret , draw correctly and construct various engineering parts which are used as communication media for production of engineering parts.

Competences

The learner:

- constructs common loci, helices and plots the loci for the link mechanisms.
- constructs pictorial views using isometric projections and draws views of isometric drawing in first angle orthographic projection.

Detailed Module Description

Duration

Sub-module 4: Loci and Helices

18 Hours

- Common loci
- Link – mechanism
- Helices construction

Sub-module 5: Isometric and Orthographic Projection

22 Hours

- Isometric projection

Orthographic 1st angle projection

- Projection symbols
- Elevations and plan
- Dimensioning and scaling

TCAM 105: Real Life Project I

Duration: 40 Hours

Module Overview

- This module equips the learner with the practical skills in fabrication, drawings, forming/machining, joining, fitting, finishing and assembly of various engineering components.
- This project equips the learner with practical skills in analysing design requirements, selection of materials, assembling of functioning systems, selecting troubleshooting methods, dismantling and assembling machine parts to their proper functioning.

Learning Outcome

By the end of this module, the learner should be to:

- Fabricate efficiently, interpret, draw correctly, form/machine, join, fit, finish and assemble various engineering components.
- analyse designs, select materials, assemble functioning systems, select troubleshooting methods, dismantle and assemble machine parts to their proper functioning.
- observes health and safety and ensures security of the equipment during execution of project activities.

Competences

The learner:

- prepares and Interprets engineering drawings.
- identifies materials/tools and machines.
- innovates and modifies components.
- carries out filing, sawing, casting, forming, tapping and dieing.
- carries out heat treatment of machine parts.
- prepares and interprets engineering drawings.
- identifies materials and tools.
- innovates and modifies components.
- selects the troubleshooting methods to identify the faults.
- interprets the operation manuals.
- identifies materials and consumables.
- selects the tools and components.
- dismantles and assembles machine parts.
- sustains constant maintenance of the unit.
- tests and operates the transmission system.
- costs and quantifies materials.
- assembles components.
- tests the assembled machine.
- prepares project reports.

Detailed Project Description

Duration

Suggested Projects :

- fabricate casement hinge
- fabricate round charcoal stove using rivets
- fabricate waste disposal units
- fabricate axle stand

• fabricate vehicle seat stand • fabricate vehicle rack • Repair tyres • alignment wheel s • spray / re-spray vehicle body • Tool box • Dust pan • Spanner • G-clamp • Screw jack • Gear box final drive overhaul • Design and wire on aboard a conventional lighting circuit NOTE: <i>The project(s) should be completed by the end of first year</i>	
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Description of Year I Term III

TCTM 101: Applied Technician Mathematics I Duration: 32 Hours	
Module Overview This module is required to enable the learners attain some mathematical skills that enable the technician to determine the size and shape of materials required and their related costs.	
Learning Outcome 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 • Equal complex numbers • Graphical representation of complex number • Polar form of complex number • Exponential form of a complex number	16 Hours
Sub-module 7: Vectors • Introduction to vector representation • Manipulation of vectors • Types of vectors • Addition of vectors • Subtraction of vectors	16 Hours

TTCCS 101: Life skills Duration: 16 Hours
Module Overview

The module introduces learners to oral and inters personal communication skills , equips them with knowledge about the working environment and to create 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 • Interventions to combat HIV and AIDS • Counselling and testing • Treatment, care and support	6 Hours

• Mitigation of stigma and discrimination • Disclosure of HIV status • HIV and AIDS workplace policy for Uganda	
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TCCA 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.

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: Power Point Presentations

14 Hours

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

Sub-module 9: Basic Networking

18 Hours

- Introduction to computer networking
- Types of network; WAN (Wide Area Networks), LAN (Local Area Network)
- 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 IPA (Internet Protocol Address)
- 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

TCAM 101: Automotive Technology and Maintenance I

Duration: 40 Hours

Module Overview

The module equips learners with the skill of troubleshooting faults, repairing and maintaining vehicle in good working condition.

Learning Outcome

By the end of this module, the learner should be able to identify the main components of braking system of vehicle and maintain them, service and maintain the main parts of the motor cycle , describe the engine construction and overhaul an engine , join materials using different welding methods and identify different forging tools used in the repair and maintenance of a vehicle.

Competences

The learner:

- identifies the main components of braking system of vehicle and maintains them to their proper function.
- services and maintains the main parts of the motor cycle.
- describes the engine construction and overhauls an engine.
- Ensure health, safety and security of vehicle and its surroundings.

Detailed Module Description**Sub-module 14: Simple Welding**

- Soldering
- Brazing
- Gas welding
- Manual arc welding
- Health , safety and security of welding machines.

Duration

8 Hours

Sub- module 15: Forging

- Forging tools
- Forge work.
- Drop forging
- Health , safety and security of foundry equipment.

6 Hours

Sub- module 16: Braking System

- Simple braking system
- Disc brakes
- Drum brakes
- Brake operating systems and components
- Overhauling braking components
- Health , safety and security of braking system.

12 Hours

Sub-module 17: Motor Cycles

- Types of motor cycles
- Power unit
- Drive train
- Frame and suspension
- Brakes
- Wheels and tyres
- Electrical system

14 Hours

• Service and maintenance of motor cycle main parts • Engine overhaul • Health , safety and security of motor cycles.	
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TCAM 102: Automotive Electric and Electronics Practice I

Duration: 24 Hours

Module Overview

The module enables learners to troubleshoot electrical faults, repair and maintain the electrical components of the vehicle.

Learning Outcomes

By the end of this module, the learner should be able to identify the various parts of the electrical auxiliaries, troubleshoot electrical faults, repair and maintain the electrical components of the vehicle.

Competences

The learner:

- identifies the various parts of the electrical auxiliaries and maintains the main components.
- services and maintains the lighting systems.
- Ensure health, safety and security of vehicle and its components.

Detailed Module Description

Duration

Sub-module 7: Electrical Auxiliaries

24 Hours

- Wiper mechanism
- Hones and related wiring
- Radio installation
- Health , safety and security of electrical Auxiliaries

TCAM 103: Technician Science I

Duration: 32 Hours

Module Overview

The module equips learners with the skill of analysing the effect of applied force on simple machines and the Properties of gases in a system.

Learning Outcomes

By the end of this module, the learner should be able to analyse the effect of applied force on simple machines and the properties of gases in a system.

Competences

The learner:

- determines the work done by simple machines and uses it to select the most effective machine to perform specific tasks.
- determines the properties of gases in a working process.

Detailed Module Description	Duration
Sub-module 6: Simple Machines - Simple machines terminologies - Limiting efficiency of a machine - Simple machine tests - Hydraulic pressure and jack - Law of machines	14 Hours
Sub-module 7: Properties of Gases - Absolute temperature and pressure - Boyle's and Charles' law - Compression ratio - Specific heat of gases - Adiabatic and isothermal expansion	18 Hours

TCAM 104: Technical Drawing I Duration: 32 Hours	
Module Overview The module equips learners with the skill of interpreting and drawing various engineering parts which is used as communication media for production of engineering parts.	
Learning Outcome: By the end of this module the learner should be able to interpret and draw accurately various engineering parts which are used as communication media for production of engineering parts.	
Competences The learner: - draws views from isometric objects in third angle orthographic projections. - illustrates various types of sections and draws sectional views of objects.	
Detailed Module Description	Duration
Sub-module 6: 3rdAngleOrthographic Projection Projection	20 Hours
Sub-module 7: Principle of Sectioning - Various Sections - Sectional views	12 Hours

TCAM 105: Real Life Project I

Duration: 32 Hours

Module Overview

- This module equips the learner with the practical skills in fabrication, drawings, forming/machining, joining, fitting, finishing and assembly of various engineering components.
- This project equips the learner with practical skills in analysing design requirements, selection of materials, assembling of functioning systems, selecting troubleshooting methods, dismantling and assembling machine parts to their proper functioning.

Learning Outcome

By the end of this module, the learner should be to:

- Fabricate efficiently, draw correctly, form/machine, join, fit, finish and assemble various engineering components.
- analyse designs, select materials, assemble functioning systems, select troubleshooting methods, dismantle and assemble machine parts to their proper functioning.
- observes health and safety and ensures security of the equipment during execution of project activities.

Competences

The learner:

- 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 dieing.
- carries out heat treatment of machine parts.
- costs and quantifies materials.
- assembles components.
- tests the machine.
- prepares project reports.
- Demonstrates the health and safety and ensures security of the equipment during execution of project activities.

Detailed Project Description

Duration

Suggested Projects :

- fabricate casement hinge
- fabricate round charcoal stove using rivets
- fabricate waste disposal units
- fabricate axle stand
- fabricate vehicle seat stand
- fabricate vehicle rack
- Repair tyres
- alignment wheel s
- spray / re-spray vehicle body
- Tool box
- Dust pan
- Spanner
- G-clamp
- Screw jack

32 Hours

- Gear box final drive overhaul
- Design and wire on aboard a conventional lighting circuit

NOTE: *The project(s) should be completed by the end of first year*

TCAM 111: Industrial Training 1

Duration: 288 Hours (6 Weeks on Average)

Module Overview

The module involves attachment to sites/industries, and practical training in Motor vehicle mechanics.

Learning Outcome

By the end of year one the learner should be able to perform corrective tasks on faulty motor vehicles., write and make a presentation on industrial work, familiarise with equipment, tools ,acquire skills in repair, maintenance of motor vehicles , plants and Maintain and repair of tools and machines, observes health and safety and ensure security of the equipment .

Competences

The learner:

- performs corrective tasks on faulty motor vehicles.
- writes and makes a presentation on industrial work.
- observes health and safety and ensures security of the equipment during IT.

Detailed Module Description

Duration

Sub-module 1: Industrial Training

- Acquaintance with Industry and sites
- Familiarisation with equipment, tools and industries
- Acquisition of skills in repair, maintenance of motor vehicles and plants.

288 Hours

- | | |
|--|--|
| <ul style="list-style-type: none">• Maintenance and repair of tools and machines• Health, safety and security of equipment. | |
|--|--|

Description of Year 2 Term 1

TCTM 201: Applied Technician Mathematics II Duration: 40 Hours	
Module Overview The purpose of this module is to impart the learners with the skill of analysing mathematical expressions that yield both simple equations to polynomials equations such as in vibrating systems of a vehicle on a series of humps. The module introduces learners to elementary polynomials and binomial theorem, their application and importance in production 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 - Factorisation 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

Sub – Module 1: Introduction To Entrepreneurship

- Meaning of entrepreneurship
- Qualities of an entrepreneur
- Entrepreneurial ethics

Duration

03 Hours

Sub – Module 2: Environmental Analysis • 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)	10 Hours
Sub – Module 3: Innovation And Creativity • Meaning of Innovation And Creativity • Characteristics of innovative persons • Forces of innovation • Barriers to creativity and innovation	04 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 • Mobilizing 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 learners to the basic Kiswahili used in the industries 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 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, air ports, water wells, forests, villages, towns, sites, hills • Names of people and professional titles like technicians, nurses, messengers, watchmen, drivers, doctors, teachers, students	18 Hours

TCAM 201: Automotive Technology and Maintenance II Duration: 50 Hours
Module Overview The module imparts to learners the skill of troubleshooting faults, repairing and maintaining vehicle systems in good working condition. The module also introduces the learner to combustion chamber designs and processes, fuel supply system, alternative engines, forced induction and engine management.

Learning Outcome

By the end of this module, the learner should be able to repair and maintain Super chargers of engines , describe the production of ferrous metals and troubleshoot faults, repair and maintain vehicle systems in good working condition.

Competences

The learner:

- illustrates the combustion process and analyses the effect of combustion chamber designs on the combustion process in the combustion chamber of an engine.
- describes the construction and operation of the fuel supply systems for the spark and compression ignition and maintains the main components to their normal function.
- identifies alternative engines as sources of power and describes their construction and operation in relation to the maintenance.
- repairs and maintains Super chargers of engines as methods of increasing engine power output.
- identifies the main components of modern engine management systems and maintains them to their normal function.
- Ensure health, safety and security of vehicle and its components.

Detailed Module Description	Duration
Sub- module 1: Combustion Process and Combustion Chamber Designs • Combustion process in petrol engine (S.I.) • Combustion process in diesel engine (C.I) and types of combustion chamber, advantages and disadvantage (Terms applied) • Combustion chambers for S.I. and C.I. engines • Crankshaft assembly vibrations • Cold starting devices removal, testing and replacement • Health , safety and security of vehicle and environment when handling combustion chambers.	8 Hours
Sub- module 2: Fuel Supply System • Fuel injection system in S.I engine (EFI) • Fuel injection system in C.I engine (Conventional/ Ordinary) • Injector pump, injector nozzle tests and air bleeding diesel fuel system • Diesel electronic fuel injection system • Health , safety and security of vehicle and environment when handling fuel supply systems.	10Hours
Sub-module 3: Alternative Engines • Wankel engine • Gas-turbine engine • Health , safety and security of vehicle and environment when handling alternative engines	10 Hours
Sub-module 4 : Super charging and Turbo charging engines (Forced induction)	10 hours

• Turbo-charging • Supercharging • Inter-cooler and waste- gate • Health , safety and security of vehicle when handling super charger engines.	
Sub-module 5 :Modern Engine Management Systems • Engine sensors systems • Engine Electronic Control Unit/Module (ECU or ECM) • Engine actuators • Engine diagnosis and troubleshooting • Health , safety and security of vehicle when handling modern engine systems.	12 hours

TCAM 202: Automotive Electric and Electronics Practice II Duration: 40 Hours
Module Overview The module equips learners with the skill of troubleshooting electrical faults, repairing and maintaining the electronic systems of the vehicle.
Learning Outcomes By the end of this module, the learner should be able to describe the construction and operation of engine management systems, describe the construction and operation of instrumentation system and troubleshoot electrical faults, repair and maintain the electronic systems of the vehicle and Ensure health, safety and security of the vehicle and its environment.

Competences

The learner:

- describes the construction and operation of engine management systems for the spark and compression ignition and maintains the main components to their normal function.
- troubleshoots Engine faults using diagnostic gauges and equipments
- identifies the main components of modern generator electronic system systems and maintains them to their normal function.
- Illustrates Lighting /signal circuit and its related repairs.
- describes the construction and operation of instrumentation system for the vehicle and maintains the main components to their normal function.
- Ensures health, safety and security of the vehicle and its environment.

Detailed Module Description	Duration
Sub-module 1: Engine Management • Electronic ignition system • Distributor less and direct ignition system • Electronic fuel control systems • Turbocharger electronic control • Emission control system • Health, safety and security of vehicle during engine management .	10 Hours
Sub-module 2: Engine Diagnosis • Engine fault diagnosis and testing using diagnostic gauges and equipments • Ignition system diagnosis using diagnostic and systematic testing using diagnostic chart, OBD and oscilloscope • Fuel injection diagnosis using diagnostic and systematic testing using diagnostic chart, OBD and oscilloscope • Exhaust and air supply diagnosis using diagnostic and systematic testing, using diagnostic chart, OBD and oscilloscope • Health, safety and security of vehicle during engine diagnosis	16 Hours
Sub-module 3: Generator Electronic System • Generation, rectification and filtering • Electronic regulators • High power LED light source • Health, safety and security of generator electronic system	6 Hours
Sub-module 4:Vehicle Lighting /Signal • Lights • Mirrors • Screens • Signalling • Headlight beam replacement and setting • Sealed beam work • Health, safety and security of vehicle lighting system	4 Hours

Sub-module 5: Vehicle Instrumentation System • Vehicle instrumentation and displays • Vehicle navigation system • Driver entertainment and communication • Circuit system testing • ICE display and speaker • Health, safety and security of vehicle instrumentation system	4 Hours
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TCAM 203: Technician Science II Duration: 30 Hours	
Module Overview The module equips learners with the skill of analysing the effect of frictional force in transmission systems of a vehicle. The module introduces the learner to aspects related to friction, transmission of motion and power in motor vehicles.	
Learning Outcome By the end of this module, the Learner should be able to describe the production of ferrous metals from the ore and selects it for use according their properties , enhance the properties of carbon steel using heat treatment, describe the production of non-ferrous metals from the ore and analyse the effect of frictional force in transmission systems of a vehicle.	
Competences The learner: • describes the production of ferrous metals from the ore and selects it for use according their properties. • enhances the properties of carbon steel using heat treatment to meet engineering application. • describes the production of non-ferrous metals from the ore and selects it for use according their properties. • describes the various types of friction and determines the frictional torque of the bearings, plate clutches, brakes. • determines the power required in the transmission systems.	
Detailed Module Description	Duration
Sub-module 1: Engineering Materials • The metallic ore • Blast furnace • Cast iron • Wrought iron (manufacture) • Manufacture mild steel • Bessemer converter processes • Open health furnace • Electric Arc furnace • Crucible steel furnace • Properties of metals • Properties of iron alloys • Plain carbon steel • Alloy steel • Alloy elements	6 Hours

Sub- module 2: Heat Treatment - Heat treatment of carbon steel - Methods of heating	4 Hours
Sub-module 3: Non-ferrous Metals - Aluminium - Copper - Tin - Zinc - Lead - Brass - Bronze, Tinning lead alloy	4 Hours
Sub module4: Friction - Types of friction - Effects of friction - Co-efficient of friction - Angle of friction - Incline and horizontal planes - Friction bearings - Plate clutches - Belts - Brakes - Frictional torque - Power loss and heat generated	10 Hours
Sub-module 5: Transmission of Motion and Power - Transmission of power by bolt, chain and gear wheel - Velocity and gear ratio - Efficiency of drive - Steering gear box	6 Hours

TCAM 204: Technical Drawing II Duration: 30 Hours	
Module Overview The module equips learners with the skill of interpreting and drawing various engineering parts which are used as communication media for production of engineering parts.	
Learning Outcome By the end of this module the learner should be able to interpret correctly, draw correctly various engineering parts which are used as communication media for production of engineering parts.	
Competences The learner: - describes various types of screw thread forms and constructs the square screw threads. - draws the various types of fasteners and locks.	
Detailed Module Description	Duration

Sub-module 1: Screw Threads • Thread terms • Thread forms • Application of screw threads • The isometric thread • Other thread forms • Square screw construction	10 Hours
Sub-module 2: Fasteners and Locks • Temporary fastener • Permanent fastener • Locking devices (locking nuts, locking washers, locking pins/ cotter pins/spilt pins, locking wires, locking keys and key ways).	20 Hours

TCAM 205: Real Life Project II Duration: 40 Hours
Module Overview This project equips the learner with practical skills in analysing design requirements, selection of materials, assembling of functioning systems, selecting troubleshooting methods, dismantling and assembling machine parts to their proper functioning.
Learning Outcome By the end of this module, the learner should be able to analyse designs, select materials, assemble functioning systems, select troubleshooting methods, and dismantle and assemble machine parts to their proper functioning and observes health and safety and ensures security of the equipment during execution of project activities.
Competences The learner: • prepares and interprets engineering drawings. • identifies materials and tools. • innovates and modifies components. • selects the troubleshooting methods to identify the faults.

• interprets the operation manuals. • identifies materials and consumables. • Ensures health, safety and security of the equipment • selects the tools and components. • dismantles and assembles machine parts. • sustains constant maintenance of the unit. • tests and operates the transmission system. • costs and quantifies materials. • assembles components. • tests the assembled machine. • prepares project reports. • Ensures Health, safety and security of equipment and environment	
Detailed Project Description	Duration
Suggested Projects • Repair and service of Starter motor • Repair and service of ECU and fuel system • Repair and service of lighting system or alarm • Repair and service of the ignition switch • Repair and service of fuel gauges, air flow meter • Repair and service of generators • Repair of stripped spark plug threads • Repair and service of Manual gear box • Repair and service of Drive lines • Repair and service of a differential unit • Repair and service of an automatic gear box • Repair and service of electronic control body system • Repair and service of vehicle air conditioning , heating and ventilation system • Repair and service of Pneumatic (air) braking system • Repair and service of Antilock braking system • Repair and service of Traction Control System (TCS) brakes • Repair and service of Power assisted steering system • Repair and service of Twin and four wheel steering • Repair and service of suspension system • Wiring of a vehicle and motor cycle • fabrication of mechanical jack • fabricate vehicle guard bracket • panel bit section of bent car NOTE: The project(s) should be completed by the end of second year	40 Hours

Description of Year 2 Term II

TCTM 201: Applied Technician Mathematics II

Duration: 40 Hours

Module Overview

The purpose of this module is to impart the learners with the skill of analysing mathematical expressions to produce derivatives of functions and vice versa for the sizing of materials and flow channels. The module introduces learners to elementary differentiation and integration, their application and importance in production industry.

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

Sub-module 4: Differentiation

- Differentiation from first principle
- Differentiation of product and quotient
- Choice of variable

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

Sub-module 6: Elementary Functions

- Functions in rules
- Functions and the arithmetic functions
- Inverse of function and graphs

Duration

14Hours

16Hours

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	06Hours
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 learners to the basic Kiswahili used in the industries and by 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	10 Hours
- 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	
Sub-module 4: General Vocabulary	10 Hours
- Names of domestic animals like goat, sheep, cow, pig, rabbit, dog, cat - Names of domestic birds like duck, turkey, hen, - Names of insects like mosquito, fly cockroach - Months in a year, days of the week, dates and telling time - Names of objects like door, window - Common usage of Kiswahili; home and garden activities - Common mistakes to be avoided	

TCAM 201: Automotive Technology and Maintenance II Duration: 50 Hours	
Module Overview This module introduces the learner to skills of troubleshooting faults, repairing and maintenance of Automatic transmission system of a vehicle.	
Learning Outcomes By the end of this module, the learner should be able to operate machine tools to produce parts, install and restore final drive transmission system , locates the main components of steering system and maintains them to their normal function and troubleshoot faults, repair and maintain automatic transmission system of a vehicle and ensures the health , safety and security of the equipment when operating machine tools.	
Competences The learner: - operates machine tools to produce parts. - identifies and locates the main components of the automatic transmission system and maintains them to their normal function. - installs and restores final drive transmission system. - locates the main components of steering system and maintains them to their normal function.	
Detailed Module Description	Duration
Sub-module 6: Machine Tools - Introduction to lathe machines - Drilling machine - Grinding machine - Milling machine - Shaping machine - Power saw machine - Re-surfacing machine - Safety, health and security of equipment	10 Hours
Sub-module 7: Automatic Transmission System - Epicyclic gear train - Principle of fluid coupling - Fluid flywheel - Hydraulic torque converter - Brake bands and clutches - Oil supply pump - Safety, health and security of automatic transmission system .	14 Hours
Sub-module 8: Final Drive Transmission System - Differential locking system - Limited slip differential unit - Single Speed Double Reduction	12 Hours

• Two Speed Double Reduction • Multi axle drive • Safety, health and security of Final Drive Transmission System.	
Sub- module 9: Steering System • Ackerman's geometry • Steering linkages • Steering boxes • Steering wheel alignment • Toe in / toe out • Castor and camber • Swivel and king pin inclination • Ball joints and truck rod ends • Safety, health and security of Steering System	14 Hours

TCAM 202: Automotive Electric and Electronics Practice II Duration: 40 Hours	
Module Overview The module enables the learners to acquire the skill of troubleshooting electrical faults, repairing and maintaining the automatic transmission electronics control, body electrical, safety, and driver comfort systems.	
Learning Outcomes By the end of this module, the learner should be able to locate the circuits of transmission electronics control , troubleshoot the faults in driver's safety control, repair and maintains them .	
Competences The learner: • locates the circuits of transmission electronics control and maintains it for normal operation. • troubleshoots the faults in driver's safety control and restores its function. • Ensure Safety, health and security of vehicle	
Detailed Module Description	Duration
Sub-module 6: Transmission Electronics Control • Automated manual gear box (semi-automatic) • Automatic transmission (ECT) • Cruise control	24 Hours

• Final drive and four wheel drive • Automatic transmission diagnosis (ECT) • Safety, health and security of transmission Electronics control	
Sub-module 7: Driver's Comfort and Safety Control • Vehicle closure and security • Parking assistance • Power seat • Safety, health and security of drivers comfort and safety	16 Hours

TCAM 203: Technician Science II Duration: 30 Hours	
Module Overview The module equips learners with the skill of analysing the effects of motion of a vehicle and engine testing results. The module introduces the learner to vehicle motion and engine performance testing.	
Learning Outcome By the end of this module, the learner should be able to calculate variables of linear motion of a vehicle, determine the parameters of engine performance and analyse the effects of motion of a vehicle and engine testing results.	
Competences The learner: • calculates variables of linear motion of vehicles. • determines the parameters of engine performance.	
Detailed Module Description	Duration
Sub-module 6: Motion • Linear • Angular • Relative • Momentum	10 Hours
Sub-module 7: Engine Testing • Engine dynamometer • Exhaust gas analysis • Compression test • Brake power and engine torque test • Indicated power test • The Morse test • Fuel consumption test	20 Hours

TCAM 204: Technical Drawing II Duration: 40 Hours	
Module Overview The module equips learners with the skill of interpreting and drawing various engineering parts which is used as communication media for production of engineering parts. The module introduces the learner to concepts of cam profile drawings.	
Learning Outcome By the end of this module, the learner should be able to interpret and draw correctly various cams and gears which are used as communication media for production of parts.	
Competences The learner: • constructs the follower motion graph and draws cam profile for the in-line follower. • tabulates the gear data and constructs the involute spur gears.	
Detailed Module Description	Duration
Sub-module 3: Cam • Types of cams and followers • Cam and follower motion • Construction of cam profile • Application of cams.	10 Hours
Sub-module 4: Involute Gears • Types of involute gears • Application of the gears • Gear nomenclature • Gear calculation • Gear construction	30Hours

TCAM 205: Real Life Project II

Duration: 40 Hours

Module Overview

This project equips the learner with practical skills in analysing design requirements, selection of materials, assembling of functioning systems, selecting troubleshooting methods, dismantling and assembling machine parts to their proper functioning.

Learning Outcome

By the end of this module, the learner should be able to analyse designs, select materials, assemble functioning systems, select troubleshooting methods, and dismantle and assemble machine parts to their proper functioning and observes health and safety and ensures security of the equipment during execution of project activities.

Competences

The learner:

- prepares and interprets engineering drawings.
- identifies materials and tools.
- innovates and modifies components.
- selects the troubleshooting methods to identify the faults.
- identifies materials and consumables.
- selects the tools and components.
- Ensures health, safety and security of the equipment
- dismantles and assembles machine parts.
- sustains constant maintenance of the unit.
- tests and operates the transmission system.
- costs and quantifies materials.
- tests the machine.
- prepares project reports.
- observes health and safety and ensures security of the equipment during execution of project activities.

Detailed Project Description

Duration

Suggested Projects

- Repair and service of Starter motor
- Repair and service of ECU and fuel system
- Repair and service of lighting system or alarm
- Repair and service of the ignition switch
- Repair and service of fuel gauges, air flow meter
- Repair and service of generators
- Repair of stripped spark plug threads
- Repair and service of Manual gear box
- Repair and service of Drive lines
- Repair and service of a differential unit
- Repair and service of an automatic gear box
- Repair and service of electronic control body system
- Repair and service of vehicle air conditioning , heating and ventilation system

40 Hours

- | | |
|---|--|
| <ul style="list-style-type: none"> • Repair and service of Pneumatic (air) braking system • Repair and service of Antilock braking system • Repair and service of Traction Control System (TCS) brakes • Repair and service of Power assisted steering system • Repair and service of Twin and four wheel steering • Repair and service of suspension system • Wiring of a vehicle and motor cycle • fabrication of mechanical jack • fabricate vehicle guard bracket • panel bit section of bent car | |
|---|--|

NOTE: The project(s) should be completed by the end of second year

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 ratios and basic statistics used in recording work progress. Statistics enable technicians to see patterns in large amounts of data, as well as the human population that the product will serve, predict about future performance conditions and usage.

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	16 Hours
Sub-module 8 : Basic Statistics • Recording of the information and frequency distribution • Types of averages • Histograms • Calculation of mean, standard deviation and assumed mean	16 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	06 Hours

- Trade Licence • Calculating VAT and Income tax payable • Filing tax returns	
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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.	
Learning Outcome 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 the tools and equipment and state 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

TCAM 201: Automotive Technology and Maintenance II Duration: 40 Hours	
Module Overview This module introduces the learner to skills of troubleshooting the faults, repairing and maintenance of automatic transmission system of a vehicle. The module further introduces learners to steering, braking and suspension systems to equip them with the maintenance skills.	
Learning Outcome By the end of this module, the learner should be able to describe the operation of power assisted steering system, adjusts and services steering system, identify the main components of electronic control suspension, differentiate the various types of braking systems and how to maintain them to their normal function, troubleshoot the faults, repair and maintain automatic transmission system of a vehicle and ensure health, Safety, and security of vehicle.	
Competences The learner: - describes the operation of power assisted steering system, adjusts and services steering system. - identifies the main components of electronic control suspension and maintains them to their normal function. - differentiates the various types of braking systems and how to maintain them. - identifies the main components of vehicle body systems and carries out relevant maintenance. - Ensure health, Safety and security of vehicle	
Detailed Module Description	Duration
Sub- module 10: Steering System - Power assisted - Twin and four wheel steering - Adjustment and service steering system. - Safety, health and security of Steering System	6 Hours
Sub- module 11: Suspension System - Hydrolastic - Air suspension/hydro-pneumatic suspension - Rubber - Electronic control suspension - Safety, health and security of suspension System	14Hours
Sub- module 12: Braking System - Pneumatic (air) - Auxiliary - Antilock braking system - Traction Control System (TCS)	14 hours
Sub- module 13: Vehicle Body	6 Hours

• Car and body technology • Air conditioning and air bag • Supplementary restraint system • Safety, health and security of vehicle body	
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TCAM 202: Automotive Electric and Electronics Practice II Duration: 32 Hours	
Module Overview The module equips learners with the skill of troubleshooting electrical faults, repairing and maintaining the electronic control of body systems and vehicle condition monitoring system of a vehicle.	
Learning Outcomes By the end of this module the learner should be able to install electronic control body system and vehicle condition monitoring and troubleshoot the faults involved, repairs and maintains it.	
Competences The learner: • installs electronic control body system and troubleshoots the faults involved, repairs and maintains it. • installs vehicle condition monitoring and troubleshoots the faults involved, repairs and maintains it.	
Detailed Module Description	Duration
Sub-module 10: Electronic Control of Body System • Trip computer • Trip electric control system • Safety, health and security of electronic control system	18 Hours
Sub-module 11: Vehicle Condition Monitoring • Black box technique for instrumentation • Air conditioning, heating and ventilation, fault diagnosing and testing • Safety Restraint System (SRS) diagnosis and testing • Safety, health and security of vehicle condition monitoring System	14 Hours

TCAM 203: Technician Science II

Duration: 24 Hours

Module Overview

The module imparts to the learners the skill of analysing forces on vehicles and periodic motion to enable learner select appropriate scientific concepts and principles that can be applied to solve motor vehicle related problems.

Learning Outcomes

By the end of this module, the learner should be able to analyse forces on vehicles and periodic motion to enable the learner select appropriate scientific concepts and principles that can be applied to solve motor vehicle related problems.

Competences

The learner:

- determines the centrifugal forces of a vehicle around the corner and carries out balancing of rotors.
- describes the simple harmonic motion and determines the amplitude of harmonics in the vibrating system.

Detailed Module Description	Duration
Sub-module 8: Forces on Vehicles • Radius of gyration • Moment of inertia • Circular motion • Centripetal, centrifugal forces and balancing • Centre of gravity above ground level • Overturning speed of vehicle on corners • Skidding when cornering • Distribution and transfer of load when cornering and braking	16 Hours
Sub-module 9: Periodic Motion • Simple harmonic motion • Frequency and amplitude • Velocity and acceleration at any instant • Variable forces producing simple harmonic motion	08 Hours

TCAM 204: Technical Drawing II

Duration: 32 Hours

Module Overview

The module equips learners with the skill of interpreting and drawing various assembled parts of a

functioning unit of a machine for production of the unit. The module introduces the learner with the technique required to draw machines and their assemblies.	
Learning Outcome By the end of this module, the learner should be able to interpret and draw correctly various assembled parts of a functioning unit of a machine and print the parts list for production of the unit.	
Competences The learner: • draws assembled views in first angle and third angle orthographic projections. • dimensions the assembled views using the required dimensioning technique. • prints the parts list.	
Detailed Module Description	Duration
Sub- module 5: Machine Drawing Assembly • Surface texture • Assembling parts together (isometric projection, Orthographic projection, sectional views, dimensioning, Drawing abbreviations, drawing conventions, screws and fasteners, locking devices)	32 Hours

TCAM 205: Real Life Project II

Duration: 32 Hours

Module Overview

This project equips the learner with practical skills in analysing design requirements, selection of materials, assembling of functioning systems, selecting troubleshooting methods, dismantling and assembling machine parts to their proper functioning.

Learning Outcome

By the end of this module, the learner should be able to analyse designs, select materials, assemble functioning systems, select troubleshooting methods, and dismantle and assemble machine parts to their proper functioning and observes health and safety and ensures security of the equipment during execution of project activities.

Competences

The learner:

- prepares and interprets engineering drawings.
- identifies materials and tools.
- innovates and modifies components.
- selects the troubleshooting methods to identify the faults.
- interprets the operation manuals.
- Ensures health, safety and security of equipment.
- identifies materials and consumables.
- selects the tools and components.
- dismantles and assembles machine parts.
- sustains constant maintenance of the unit.
- tests and operates the transmission system.
- costs and quantifies materials.
- assembles components.
- tests the machine.
- prepares project reports.
- observes health, safety and ensures security of the equipment during execution of project

activities.	
Detailed Project Description	Duration
Suggested Projects: • Repair and service of Starter motor • Repair and service of ECU and fuel system • Repair and service of lighting system or alarm • Repair and service of the ignition switch • Repair and service of fuel gauges, air flow meter • Repair and service of generators • Repair of stripped spark plug threads • Repair and service of Manual gear box • Repair and service of Drive lines • Repair and service of a differential unit • Repair and service of an automatic gear box • Repair and service of electronic control body system • Repair and service of vehicle air conditioning , heating and ventilation system • Repair and service of Pneumatic (air) braking system • Repair and service of Antilock braking system • Repair and service of Traction Control System (TCS) brakes • Repair and service of Power assisted steering system • Repair and service of Twin and four wheel steering • Repair and service of suspension system • Wiring of a vehicle and motor cycle • fabrication of mechanical jack • fabricate vehicle guard bracket • panel bit section of bent car NOTE: <i>The project(s) should be completed by the end of second year</i>	32 Hours

TCAM 211: Industrial Training II Duration: 288 Hours (6 Weeks on Average)	
Module Overview The module involves attachment of learners to garages/industries to acquire practical training in motor vehicle mechanics.	
Learning Outcome By the end of this module, the learner should be able to diagnose faults and problems with motor vehicles, fix the identified faults, keep maintenance records, write and make a presentation on industrial/field/site work. attain practical skills in automobile mechanics needed by the world of work.	
Competences The learner: • diagnoses faults and problems with motor vehicles. • fixes the identified faults and problems. • writes and makes a presentation on industrial/field/site work. • keeps maintenance records • observes health and safety and ensures security of the equipment during execution of project activities.	
Detailed Module Description	Duration
Industrial Training • Acquaintance with Industry and sites • Familiarization with equipment, tools and sites • Acquisition of skills in repair, maintenance and fabrication of components.	288 Hours

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:
 - 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 least once, and interacts with both the learner and field supervisor .

Assessment

Assessment marks should be categorized 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 by each category must 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 Innovation	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	1		

	break-off or stoppage time			
	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 accident	2		
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	4		

	and maintain tools and workplace)			
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	3		

	and how they were solved?			
	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 1510 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	2 Marks

	iii) Structure, organization iv) Tasks carried out by the place attached to e.g. if District Local Government describe its role in society	
9	Main body of the report i) Description of work carried out ii) Duties and responsibilities assigned and how they were carried out iii) New knowledge and skills gained iv) Relationship with other staff and supervisor v) Problems experienced and how they were handled	8 marks
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 mark
13	Appendices i) Drawings ii) Photographs, etc	1 mark
Total mark		20 marks

Appendix v: Tools and Equipment for the Institution

Foundry/Heat Treatment/Forge Workshop

• Black smith forge (1) • Anvil and stand (8) • Tongs (assorted) (5 each) • Swage block (2) • Leg vice (2) • Black smith hand hammer (various sizes) (6 each) • Sledge hammer (4) • Flatters (6) • Hardles (6) • Hot chisels (6) • Cold chisels (6) • Fuller (6) • Top and bottom swage (various sizes) (6 each) • Heading tool (6 each) • Heat treatment furnace (1) • Salt bath furnace (1) • Electric furnace with control (2) • Hacksaw frame and blades (10) • Tapered shank drill bits (2 sets) • Straight shank drill bits (2 sets) • Drill drift (2 sets) • Eye Goggles (10) • Face shield (10) • Heat resistant gloves (10 pairs) • Knee leggings (foundry) (10 pairs) • Leather apron (10 pairs) • Safety boots (fire resistant) (10) • Moulding bench (10) • Bottom flask (20) • Moulding flask (20)	• Quenching bath (2) • Thermocouples (5) • Optical pyrometer (2) • Induction hardening equipment(1) • Flame hardening equipment (2) • Carburising equipment(2) • Crucible furnace (1) • Crucible (4) • Crucible rest or stool (2) • Crucible lifting tongs (2) • Combined slag lifter and skimming ladle (1) • Combined portable thermocouple pyrometer (1) • Degreasing plunger (2) • Hammers (assorted) (6 each) • Wire brush (2) • Pedestal grinder (1) • Pillar drilling machine (2) • Rammers (various types) (20) • Moulding trowels (various sizes) (10) • Strike-off-bars (10) • Gate cutter or spoon (10) • Sprue pins (20) • Vent rods (20) • Bellows (5) • Lifters (10) • Bubble sponges (5) • Draw pins (50) • Wet brush (30)
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• Moulding sand shovel (20) • Watering can (5) • Wheel-barrow (4) • Jointer (1) • Scraper (1) • Pattern milling M/C • Disc and bobbing sander • Measuring and marking out tools (10) • Sawing, planing, boring, turning etc tools (10 each) • Charge make - up Scale (100 kg scale) • Band saw (2) • Jig saw (2) • Circular saw (2) • Wood plane-machine	• Bench vice (4) • Hand vice (2) • Cutting pliers • Combination pliers (10) • Half round bastard file (10) • Flat file second cut (10) • Triangular file (10) • Round file (10) • Sand mixing machine (1) • Moulding machine (1) • Continuous mixer machine dispenser (1) • Core boxes (10) • G. clamps (10) • Core driver (1) • Woodworking lathe (1)
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Mechanical Machines

• Screw Jack (1) • Oldham coupling (1) • Four bar chain mechanism (1) • Whitworth quick return mechanism (1) • Slider crank mechanism (1) • Hooks joint (1) • Geneva stop (1) • Conservation of angular momentum (1) • Forces on beam apparatus (1) • Simple moment beam (1) • Comprehensive fly wheel apparatus (1)	• Spring balance (1) • Gearing system apparatus (1) • Compression apparatus (1) • Wheel and axle set (1) • Centrifugal/centripetal apparatus (1) • Polygon of force apparatus (1) • Extension and compression of springs apparatus (1) • Crank and connecting rod apparatus (1) • Rope, belt and coil friction apparatus (1) • Cam and cam follower mechanism (1) • Fire extinguishers (42) • Sand and water buckets (4)
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• Bourdon tube pressure gauge (1) • Torsion of bar apparatus (1) • Foot shear machine	
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Strength of Materials

• Shearing force apparatus (1) • Bending moment apparatus (1) • Tension meter (1) • Fire extinguishers (4) • Sand and water buckets (4)	• Surge in pipe apparatus (1) • Hydrostatic Bench (1) • Air flow demonstration apparatus (1) • Laminar/turbulent pipe flow (1) • Centrifugal and axial fan test rings (1)
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Materials Science

• Floor mounted tensile/compression testing machine with accessories (1) • X-Y recorder for tensile tester (1) • Table top tension meter with accessories (1) • Macro hardness testing machine (Brinell,, Vickers, Rockwell) (1 each) • Impact testers (Izod,) (2) • Micro hardness testing machine (1) • Strain gauge (2) • Creep testing machine (1) • Torsion tester (1) • Fatigue tester (1) • Steel rule 300mm (5) • Outside caliper (2) • Inside caliper (5) • Set of open ended spanners (2) • Micrometer screw gauge (metric) (2 sets)	• Allen keys (2 sets) • Screw drivers (2) • Abrasive cutters (1) • Dial gauge (1) • Pedestal grinder (1) • Fire extinguisher (1) • Sand and water buckets (4) • Grinding machine (2) • Polishing machine (2) • Metallurgical microscopes (5) • Parting machine (1) • Etching machine (1) • Microscope (1) • Specimen mounting screen (2) • Decicators (2)
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Metrology Laboratory

• Comparator-Mechanical (1) • Universal measuring microscope (1) • Bench testing centres (1) • Angle gauge (1) • Set of slip gauge (1) • Sine bars with centres (1) • Engineers level (1) • Micrometers-assorted denomination(2 each) • Vee blocks -assorted sizes(2 each) • Magnetic vee block (1) • Vernier callipers (3) • Vernier height gauge (2) • Angle plate (1)	• Limit gauges for holes, shafts, and threads (3 each) • Surface plate 1 • Marking out table (1) • Parallel strips (4 pairs) • Bevel protractor (2) • Dial gauges and magnetic stand (2) • Engineers' square (2) • Thread gauge (2) • Radius gauge (2) • Feeler gauge (2) • Steel rule (4) • Combination set (2)
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Power/Plant Laboratory

• Air flow measurement Demonstration air flow test rig 1 • Smoke tunnel (1) • Heat transfer apparatus-parallel counter flow (1) • Double pipe heat exchanger (1) • Engine test beds with: petrol and diesel engine, CI and SI two stroke and four stroke (1 set each) • Tutor gas turbine (1)	• Two stage compressor test set (1) • Pump and water turbine test set (1) • Air heaters (1) • Dust extractors (1) • Draught equipment (Fans) (1) • Fire extinguishers (4) • Sand buckets (2)
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