YEAR 2

SEMESTER 1

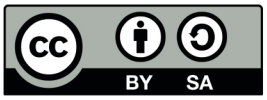
Four-Year B.Ed. Course Manual

TVET - METAL AND AUTOMOTIVE TECHNOLOGY 1

GHANA TERTIARY EDUCATION COMMISSION

NATIONAL TEACHING COUNCIL
NTC
Building Confidence, Raising Teaching Standards

The Government of Ghana



FOREWORD

These Initial Teacher Education course manuals were developed by a team consisting of members from Colleges of Education and four universities namely the University of Ghana, Kwame Nkrumah University of Science and Technology, University of Education, Winneba, and University for Development Studies. This team was originally constituted by the National Council for Tertiary Education (now the Ghana Tertiary Education Commission) in 2019 to support the delivery of the new B.Ed. curriculum with assistance from T-TEL and UK Aid. The revision, finalization and printing of these manuals took place in 2021 with support from T-TEL and Mastercard Foundation.

The course manuals have been produced for use as general guides for the delivery of the new four-year B.Ed. curriculum in Colleges of Education in collaboration with their affiliated universities. They are designed to support student teachers, tutors and lecturers in delivering a complete B.Ed. course for training student teachers which meet the requirements of the National Teachers' Standards, enabling them to teach effectively in basic schools.

The first section of the manuals is focused on the course information and vision for the B.Ed. curriculum. The second section presents the course details, goal for the subject or learning area, course description, key contextual factors as well as core and transferable skills and cross-cutting issues, including equity and inclusion. The third section is a list of course learning outcomes and their related learning indicators. The fourth section presents the course content which is broken down into units for each week, the topic and sub-strands and their related teaching and learning activities to achieve the learning outcomes and the teaching and learning strategies. This is followed by course assessment components in section five. Each manual contains a list of required reading and references as well as teaching and learning resources. The final section presents course related professional development for tutors and lecturers to be able to use each section of the manual.

Field instructions to guide Supported Teaching in School are integrated into the course manuals to provide the student teacher with guidance in developing teaching throughout the entire period of study to be able to meet the requirements of the National Teachers' Standards (NTS) and the National Teacher Education Curriculum Framework (NTECF). To ensure maximum benefit the course manuals should be used in addition to other resources such as the NTS, NTCEF, National Teacher Education & Assessment Policy and the National Teacher Education Gender Equality and Social Inclusion (GESI) Strategy and Action Plan. This will help to ensure that student teachers learning is integrated within the wider teacher education policy framework.

Professor Mohammed Salifu Director General, Ghana Tertiary Education Commission

ACKNOWLEDGEMENTS

The course manuals were developed through the collaborative efforts of a team of individuals from Colleges of Education, University of Ghana, Kwame Nkrumah University of Science and Technology, University of Education, Winneba and University for Development Studies. They were produced in association with the Ghana Tertiary Education Commission of the Ministry of Education, Ghana.

A participatory team approach was used to produce these sets of resources for tutors/lecturers, mentors and student teachers. We are grateful to the specialists who contributed their knowledge and expertise.

Special thanks to Professor Jophus Anamuah-Mensah - T-TEL Key Advisor, Dr. Eric Daniel Ananga T-TEL Key Advisor for Curriculum reform and Beatrice Noble-Rogers who provided key editorial, review and content input and facilitated the process of drafting and finalising the course manual.

Patricia Appiah-Boateng and Gameli Samuel Hahomene, served as typesetting and formatting coordinators and designed and produced the illustrations, tables and other graphics which appear in the pages. They spent time and effort designing and redesigning the graphic layout and producing the camera-ready copies resulting in a set of materials that are easy to use, read and reference.

Thanks also goes to all T-Tel staff members who worked to support production of these course manuals, particularly Beryl Opong-Agyei and Gideon Okai. Their frankness and co-operative attitude complimented the team is approach used to produce these manual.

We are indebted to the Ministry of Education and the Ghana Tertiary Education Commission (GTEC) for the general support and specific helpful advice provided during production of the course manuals. Recognition and thanks must go to Chief Technical Advisor for T-TEL and Policy Advisor to the National Education Reform Secretariat, Akwasi Addae-Boahene, Prof. Mohammed Salifu, the Director General of GTEC and Mr. Jerry Sarfo the coordinator for the colleges of education, who in diverse ways supported during the course manual writing workshops.

In addition to all the staff who participated visibly in the development of these materials we would like to acknowledge all those people from the many colleges of education and universities in which we have worked and who have directly or indirectly, shared their views on the curriculum with us.

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INTRODUCTION TO COURSE MANUALS

Welcome to this B.Ed. Course manual.

Following the accreditation of the B.Ed. by the national accreditation Board with its recognition as a world class teacher education curriculum, the decision was taken to support effective implementation through the development of course manuals. the course manuals provide tutors and lecturers with the materials necessary to support teaching each of the B.Ed. courses. The manuals adhere directly to, and emphasise, the principles and standards set out in the NTS, NTECF and in the B.Ed. and will help ensure operationalising the Government's teacher education reform Policy.

The manuals serve the following purposes:

- they are the key educational agreements between the training institution and the student teachers. In this way student teachers know what the expectations are for them and for the training they will receive.
- they lay out the course outcomes, content, strategies, and assessment, thereby providing direction to and consistency in training and B.Ed. implementation among tutors across the country.
- they are explicit documents that provide other institutions with information on which to base transfer/ articulation decisions.

Specifically, they also:

- support coherent lesson planning and teaching which will enable student teachers to achieve the NTS and become good teachers who ensure all pupils' learning whilst offering tutors the flexibility for adaptation for local needs and contexts.
- Provide a lesson by lesson overview of the course, building on and developing the material in the course specifications.
- Inform tutors, student teachers and others working with student teachers about:
    1. What is to be taught and why.
    2. how it can be taught.
    3. how it should be assessed.
- Provide opportunities for student teachers to develop and apply knowledge during supported teaching in school, creating a strong bond between learning in school and in the training institution.
- Reflect the stage of student teacher development, set out in the model for progress across the four years of the B.Ed.
- Can be used as self-study tools by student teachers.
- Ensure that all information necessary to inform teacher training is in one place (serves as reference document).
- The manuals are the basis of the codes and university professional development sessions to ensure Principals, tutors, lecturers and heads of department are fully familiar with the details of: courses, outcomes, content, approaches, assessments and lessons.

Who are course manuals for:

- College of Education Tutors
- Teacher Education University Lecturers
- Student Teachers
- Mentors and Lead Mentors
- All Those with An Interested In Teacher Education.

USING THIS MANUAL

Writers of the manuals engaged widely with colleagues in each subject area at each stage of development. Besides, writers envisaged themselves in varied contexts as they wrote, to suggest methodologies and strategies for teaching the strands which would ensure student teachers are enabled to achieve the learning outcomes. In view of our commitment to creativity, problem solving, collaboration and to lifelong learning, we expect that individual tutors will "own" their manuals and become user-developers. lessons in the manuals will be strands for weekly Pd meetings where tutors/lecturers will situate the lessons in the contexts of their colleges and their student teachers, to maximize the benefits.

It is also expected that tutors will model the best pedagogic practices for student teachers. Key among such practices is the communication of the importance of having a personal teaching philosophy. We expect that tutors and lecturers will explicitly communicate their personal teaching philosophies to their student teachers during the first meeting of every course. in preparation for this, we suggest you set out your personal teaching philosophy and how it will be demonstrated in your teaching using, or adapting, the sample sentence introductions below.

My teaching philosophy is ……..

In view of this philosophy, I will facilitate this course by/through ……

Course Manual Writing Guide

Resources for Course Manual Writing

- Soft copies of the CWG, New Four-Year B.Ed. Curriculum introduction
- Soft and hard copies of the course specifications for the subject for year one and two
- Soft and hard Course Manual Writing Guide (CMWG)
- Relevant subject texts

Target Audience

- College of Education Tutors
- Teacher Education University Lecturers
- Student Teachers
- Mentors

The purpose of course manuals

- To provide a lesson by lesson overview of the course, building on, adapting and developing the material in the course specifications
- To provide a resource to support professional development sessions for tutors/lecturers on how to plan for and teach courses from the New Four-Year B.Ed. Curriculum
- To inform tutors /lecturers, student teachers and others working with student teachers about:
  - what is to be taught and why
  - how it can be taught
  - how it should be assessed
- To support consistency in the implementation of the New Four-Year B.Ed. across institutions who train teachers
- To ensure that all **training** information on skills, processes, and other information necessary to perform the teaching task are together in one place.
- To operationalize the Teacher Education Reform Policy; the requirements of the NTS & NTECF and the Four-Year B.Ed.

Guiding principles of course manual writing

1. They are written with the learner, the student teacher, in mind: what they will *be able* to cope with and only include what student teachers need to know, understand, be able to do and be as a basic school teacher
2. They take in to consideration the learner's, the student teacher's, context and possible barriers to, and enablers for, learning
3. They are written with the tutors /lecturers who are going to teach the course in mind. Tutors must be able to adapt and develop the plans in course manuals to fit the context they are teaching in and to support their teaching
4. They are aligned to the key principles and practices of the Teacher Education Reform Policy: the NTS, the NTECF and the New Four-Year B.Ed.
5. They are written to provide opportunities for student teachers to develop and apply knowledge during supported teaching in school
6. They are written to reflect the stage of student teacher development, set out in the model for progress in the New Four-Year B.Ed.
7. They are written to support progress in student teacher learning, including building on prior learning from the previous programme or course/s and supporting progress to the next course.
8. They are to be used as self-study tools.
9. They are written to have the following characteristics: easy to read; uses active voice and avoids jargon; uses bullet points to offset text; uses images

What a teacher educator needs to know, understand and use to inform what they do

- The aims and structure of the education system and Education strategic Plan
- The Basic School Curriculum
- The Inclusion Policy
- The teacher education system: The National Teacher's Standards, the vision for teacher education and the core principles of the New Four-Year B.Ed.
- Andragogy, effective methods and practices for teaching adult learners
- Assessment Literacy. Assessment for, of and as learning -Educative Assessment

Guidance for completing the course manual writing proforma: two sections

A. Course Information

Title Page

i. Metal and Automotive Technology 1

ii. The vision for the New Four-Year B.Ed. Curriculum

''To transform initial teacher education and train highly qualified, motivated new teachers who are effective, engaging and fully prepared to teach the basic school curriculum and so improve the learning outcomes and life chances of all learners they teach as set out in the National Teachers' Standards. In doing this to instil in new teachers the Nation's core values of

honesty, integrity, creativity and responsible citizenship and to achieve inclusive, equitable, high quality education for all learners. ''

iii. Course Details: as in course specification unless important reason why not						
Pre-requisite/s	TVET related subjects from WASSCE/National Certificate II (Technical)					
Co-Requisites						
Course Level	200	Course Code		Credit Value	3	

Table of contents

Each manual will include:

1. The goal for the subject or learning area
2. Course description
3. Key contextual factors
4. Core and cross cutting issues, including equity and inclusion
5. Course Learning outcomes
6. Course content
7. Teaching and learning strategies
8. Course Assessment components
9. Reading and reference list
10. Handouts, power points and other resources for lessons
11. Plans for each lesson in the semester

A. Course information

1. Goal for the Subject or Learning Area

*Metal and Automotive Technology*is designed to introduce the student teacher to the concepts, foundations and history of the Mechanical engineering industry which dates back to the medieval era. The course is also intended for the student teacher to explore the nature of relevant tools and materials in the engineering industry and to be introduced to foundational manipulative processes/skills in the engineering industry.

2. Key contextual factors

The education system has focused on preparing students for examinations, instead of helping them to develop the relevant industry and entrepreneurial skills which could enable them function successfully in life.

3. *Course Description*

This course is designed to introduce the student teacher to the concepts, foundations and history of the engineering industry which dates back to the medieval era. The course is also intended for the student teacher to explore the nature of relevant tools and materials in the engineering industry. Through guided demonstrations and simulations the student teacher will be introduced to foundational manipulative processes/skills in the metal and automotive industries. The topics involved the Philosophy and history of engineering, philosophies, concepts and safe working environment in the metal and automotive industries.Knowledge in personalsafety and safe working environment in the metaland automotive industriesand knowledge in Materials safety i.estorage, handling, transporting and disposal are covered. The course also involvethe relevantknowledge ofMaterials used in the Metal and Automotive Industries–Metals: Ferrous Metals (Cast iron and Steel), Non-ferrous metal, Alloys, Properties (mechanical, Physicaland Chemical), Methods of identifying metals andskills in Manufacturing Processes of Plastics.

These areas will provide the student teacher with the understanding of various metal and automotive concepts, foundations and historical perspective. It is also to provide the basis for efficient and effective knowledge and appropriate utilization of metal and other related materials. Additionally, student teachers will have firm knowledge base and understanding for selecting metal types and making decisions about alternatives to the main material metal. It also prepares the student teacher for work (practitioner) by equipping him/her with the knowledge and skills in problem-solving, critical thinking and creativity. The student teacher is expected to cultivate interest in hands-on learning and develop responsible citizenship to appreciates the dignity of work and contribute to sustainable society. Thus, the. The course will be delivered using the following methods: Discussion, presentations (group/individual), seminar, project work/practical work, demonstrations, brainstorming, simulation, and industrial visits. The following assessment modes will be used: Examination, tests, project work, class assignments and presentations, and portfolio.

As part of the course requirements, the student teachers will be required to undertake various projects and produce artifacts. In the process of designing and producing the artifacts, the student teacher will be introduced to relevant issues of equity and inclusivity within the industry as well as the concept of greening TVET by way of considering recycling, re-designing or re-using waste.

As part of developing teaching, the student teachers are also exposed to observation in the school environment where they are to reflect on their professional practice by engaging positively with colleagues, mentors, learners and other stakeholders and build a portfolio reflecting a better understanding of the JHS learner and the learning environment showing growing comprehension and application of the concepts of inclusivity, equity, access for all learners irrespective of ability, gender or socio-economic status and cultural background. During such reflections, student teachers are to relate

their knowledge acquired in metals Technology to the school environment. The course is designed to meet the following NTS and NTECF requirements: NTS pg. 14,c, j, 24e, f, 26 j, NTECF pg. 16, 29,33,38.
Core and transferable skills and cross cutting issues, including equity and inclusion
Core and transferable skills: Critical thinking, problem solving, communication skills, and use of ICT **Cross-cutting issues**:
This can be found in the course specification. Which core and transferable skills or cross cutting issues will be applied or developed through this course? This needs to be made explicit to student teachers. Are there specific issues to do with equity and inclusion which must be addressed so that all student teachers can fully take part? For example, issues related to gender and mathematics or science.

4. Course Learning Outcomes	*5. Learning indicators*
By the end of the course, Students teachers will be able to	
CLO.1 Demonstrate knowledge and understanding in the relevant foundational history, philosophies, concepts and Safe Working environment in the metal and automotive industries	1Produce a report on the relevance foundational history and philosophies inthe metal and automotiveindustries. 1.2 Prepare a report showing the concepts and trends in the metal and automotive industries using Internet resources. 1.3 Use ICT resources (video)to discuss the modern developments and challenges facing the metal and automotive industries
CLO 2. Exhibit knowledge and skills in the processes and proper use of training materials in the metal and automotive industries. (NTS pg. 10, NTECF pg. 29).	2.1 Make a portfolio on the training materials used in the metal and automotive industries 2.2 Prepare a project work involving the use of materials in the Metal and Automotive industries
CLO.3 Demonstrate knowledge and skills in the processes and proper use of tools, equipment and machines in the metal and automotive industries. (NTS pg. 10, NTECF pg. 29)	3.1 Use and operate tools, equipment and machines in the metal and automotive industries.
CLO 4. Exhibit knowledge and understanding of the operation of Internal Combustion Engines.	4.1 Use simulations and pre- video recordings from Internet source to demonstrate and discuss the operation of engines. 4.2 Discuss and produce a report comparing compression and spark ignition engines

6. Course content

In the course specification. This should provide an outline of the academic and / or practical content of the course. It should be clear how this content relates to the achievement of the intended learning outcomes. The name of each unit in the course should be *briefly* set out – the name should make it clear what the unit is about.

Unit	Topic	Sub-topic (If any)	Teaching and learning activities to achieve the learning outcome
1	Philosophy and history of engineering, philosophies, concepts and safe working environment in the metal and automotive industries.	1.Self-Introduction(If Tutor is new to the Class) 2.Introduction to the Metal And Automotive Technology I Manual 3.Philosophy of the metal and automotive industries. 4.History of metal Production 5.Modern developments and challenges facing the metal and automotive industries	Through face-to-face interaction, Tutor/lecturer and student-teachers introduce themselves Tutor/Lecturer initiates discussion on the course manual emphasizing on the objectives, learning outcomes, course content and reference material Tutor facilitates student teachers revision of previous knowledge on objects made from metals and also types of vehicles they travel with.
2	Materials used in the Metal and Automotive Industries	Metals a. Ferrous Metals (Cast iron and Steel) b. Non-ferrous metal	Tutor facilitates student teachers revision of previous knowledge on Materials used in the Metal and Automotive Industries

		c. Alloys d. Properties (mechanical, Physical and Chemical) e. Methods of identifying metals	Tutor uses**Interactive lecture** to make brief presentation on Ferrous Metals (Cast iron and Steel) OR Tutor will use **pre- video recordings** from sources (YouTube, Khan Academy, Coursera, Udemy, MOOCs) toDiscuss the production processes of ferrous metals (pig iron, cast iron andsteel)
3	Tools, Machine; and Metal Work Joining Processes	Identification and uses of 1.measuring tools 2. marking out tools 3. Holding tools 4.Striking tools 5.Cutting tools o Files o Chisels o Hacksaws 6.Finishing tools and Processes. Classification of metal work joining processes (permanent and temporary) • Riveting, Soldering and Brazing processes and equipment	Tutor uses**Interactive lecture** to make brief presentation Identification of Tools/Equipment- Measuring, Marking and Holding OR Tutor will use **pre- video recordings** from sources (YouTube, Khan Academy, Coursera, Udemy, MOOCs) to Discuss and present manipulative skills on Measuring, Marking, Holding and StrikingTools/Equipment
4	Operation of Internal Combustion Engines	1.History of engines. 2.Layout of an engine. 3. Type of Internal Combustion engines. Spark Ignition Engines Compression (Diesel) Engines Principles of operating Internal Combustion Engines.	Tutor facilitates student teachers revision of previous knowledge on Engines of Vehicles. Tutor uses **Interactive lecture** to make brief presentation on the History of engines. OR Tutor will use **pre- video recordings** from sources (YouTube, Khan Academy, Coursera, Udemy, MOOCs) to discuss History of engines

7. Course Assessment Components

In the course specification. The NTS and the NTECF require a move away from largely examination-based assessment to strategies to enable assessment of student teachers' skills, knowledge and understanding against the learning outcomes and through these the against the NTS

- There should be a maximum of 3 assessment components per 3 credit-course; to avoid over loading student and tutors/ lecturers
- The learning outcomes to be assessed by each assessment component should be identified.
- Each assessment component should explicitly reference the NTS or aspects of the NTS it will assess.
- Each assessment component should include:
  - The category or type, for example: written, coursework or practical, teaching, examination, collaborative project or presentation, poster, TLM
  - The type of assessment: of, for and /or as.
  - An indication of the size of each assessment component (e.g. duration of exams, word limit of written submissions, length of presentations; whether presentations have an individual or group etc.).
  - The weighting of each assessment component should be expressed as a % of total course mark (overall in each course: 60% continuous assessment of course work, 40% examination of course work).
- Each assessment should be manageable and relevant to supporting the student teachers' development.

The guidance on assessing student teachers from the NTS, the NTECF the CWG and the New Four Year B.Ed. should be used.

Summary of Assessment Methods

Component 1: Examination
Assessment Type: Assessment of Learning

Category of Assessment: Written Examination
Maximum Duration: 3 hours
Students teachers are assessed by summative examination on:

- The relevant foundational history, philosophy in Metal and Automotive Technology.
- Materials used in the Metal and Automotive Industries
- Tools, Machine; and Metal Work Joining Processes.
- Operation of Internal Combustion Engines.

Learning Outcomes Assessed: CLO 2, CLO3, CLO 4& CLO5; NTS pg. 14(c & j); pg. 24 (e & f); pg. 26 (j)
Weighting: 40%

Component 2: Continuous Assessment 1
Assessment Type: Assessment for and as Learning
Category of Assessment:
Student teachers assessed through **Presentations** and **Reports**on:

- The relevant foundational history, philosophy in Metal and Automotive industry.
- Materials used in the Metal and Automotive Industries
- Tools, Machine; and Metal Work Joining Processes.

Learning Outcomes Assessed: CLO 1; CLO 2 & CLO 3; NTS pg. 14 (b)
Weighting: 30%

Component 3: Continuous Assessment 2
Student teachers assessed through**Portfolio** and **Project Work** on**:**

- The relevant foundational history, philosophy in Metal and Automotive Technology.
- Materials used in the Metal and Automotive Industries
- Tools, Machine; and Metal Work Joining Processes.
- Operation of Internal Combustion Engines.

Learning Outcomes Assessed: CLO 1; CLO 2 & CLO 3; NTS pg. 12 (a, b & c); pg. 13 (c); pg. 14 (b)
Weighting: 30%

8. Teaching and learning strategies

Detail in this section should show how the total learning hours will be used to achieve the intended learning outcomes, to provide a guide to the teaching and learning strategies to be used. Each teaching strategy should be selected as most appropriate to achieving the learning outcomes. This may include team teaching or additional tutors. As stated in the B.Ed. experiential learning and interactive teaching approaches are encouraged

Discussion, presentations (group/individual), seminar, project work/practical work, demonstrations, brainstorming, simulation, and industrial visits

9. Required Reading and reference list

One or two compulsory texts which must be made available to the student teachers and a SHORT list of 5 relevant references. These lists should be annotated with the key value of each text. Use APA style of writing.

Amoakohene, S.K. et al (1998). *Technical skills and drawing for teacher training Book 2 (Tools and processes and methodology*). Accra: Unimaxin association with Macmillan Educ. Ltd. Cambridge University Press.
Callister, W.D and Rethwisch, D.G (2013). Materials Science and Engineering: An Introduction 9th Edition. Wiley.
Denton, T. (2014). Automobile electrical and electronic systems. Amsterdam: Butter-worth-Heinemann.
Dolan, J.A. (1979). Motor vehicle technology and practical work (Parts 1 and 2). Hong Kong: Heinemann Educational Books Ltd.

10. Teaching and Learning Resources

Instructional resources required to support learning during the course e.g.: TLMs, lab and workshop equipment, videos, projectors

Basic Metal and Automotive tools and equipment, metal materials (Metals- a. Ferrous Metals (Cast iron and Steel), b. Non-ferrous metal, c. Alloys,
d. Properties (mechanical, Physicaland Chemical)

Course related professional development for tutors/ lecturers

This is not included the course manual but professional development needs must be identified to ensure all tutors / lecturers are prepared to teach the course identify any specific topics or issues which may be challenging for tutors / lecturers.

LESSON 1

Year of B.Ed.	2	Semester	1	Place of lesson in semester	1 2 3 4 5 6 7 8 9 10 11 12

Title of Lesson	Philosophy and history of engineering, philosophies, concepts and safe working environment in the metal and automotive industries.				**Lesson Duration**	**180 minutes**	
Lesson description	The lesson is to enable the student teacher to acquire the requisite knowledge and understanding of the skills in themetal and automotive industries. The student teacher will be introduced to the philosophy and history of engineering (metal and automotive technologies), safety and safe working environment in metaland automotive industries. This first lesson introduces student to the course learning outcomes and three 3 assessment components of the course.						
Previous student teacher knowledge, prior learning (assumed)	Student-teachers are: • Familiar with objects made from metals. • They also travel in vehicles.						
Possible barriers to learning in the lesson							
Lesson Delivery – chosen to support students in achieving the outcomes	**Face-to-face☑**	**Practical Activity**	**Work-Based Leaning**	**Seminars**	**Independent Study**	**e-learning opportunities ☑**	**Practicum**
Lesson Delivery – main mode of delivery chosen to support student teachers in achieving the learning outcomes.	Use Face to Face**Interactive lecture** to make brief presentation onPhilosophy and historyof engineering, philosophies, concepts and safe working environment in the metal and automotive industries. Use **pre- video recordings** from sources (YouTube, Khan Academy, Coursera, Udemy, MOOCs) to discuss, prepare and present a Portfolio on the Philosophy and history of engineering, philosophies, concepts and safe working environment in the metal and automotive industries.						
• **Purpose for the lesson, what you want the students to achieve, serves as basis for the learning outcomes. An expanded version of the description.** • **Write in full aspects of the NTS addressed**	The purpose of this lesson is to introduce student teachers to thePhilosophy and history of engineering,philosophies, concepts and safe workingenvironment in the metal and automotive industries.						
• **Learning Outcome for the lesson, picked and developed from the course specification** • **Learning indicators for each learning outcome**	**Learning Outcomes**	**Learning Indicators**	**Identify which cross-cutting issues - core and transferable skills, inclusivity, equity and addressing diversity. How will these be addressed or developed.**				
	CLO.1 Demonstrate knowledge and understanding in the relevant foundational history, philosophies, concepts and Safe Working environment in	1Produce a report on the relevance foundational history and philosophies in the metal and automotive industries. 1.2 Prepare a report showing the concepts and trends in the metal and automotive industries using Internet resources. 1.3 Use ICT resources (video)	• critical thinking • diversity and inclusivity, • information literacy,				

	the metal and automotive industries.	to discuss the modern developments and challenges facing the metal and automotive industries		
Topic	**Topic Sub-topic**	**Stage/Time**	**Teaching and learning activities to achieve learning outcomes: depending on delivery mode selected. Teacher led, collaborative group work or independent study**	
			Teacher Activity	**Student Activity**
Philosophy and history of engineering, philosophies, concepts and safe working environment in the metal and automotive industries.	1**.Self-Introduction(If Tutor is new to the Class)** Introduction to the Metal And AutomotiveTechnology I Manual Philosophy of the metal and automotive industries. History of metal Production .Modern developmet and	Stage 1 - 30 min	**.Self-Introduction(If Tutor is new to the Class)** Through face-to-face interaction, Tutor and student-teachers introduce themselves **Course Manual Introduction** Tutor initiates discussion on the course manual emphasizing on the objectives, learning outcomes, course content and reference material **Lesson Introduction** Tutor facilitates student teachers revision of previous knowledge onobjects made from metals and also types of vehicles they travel with.	**Self-Introduction(If Tutor is new to the Class)** Student-teachers do self-introduction (Tutors and student-teachers) **Course Manual Introduction** Student-teachers discuss the manual and what they expect to learn after studying the course **Lesson Introduction** Student teachers answer question and do brief discussions.
		Stage 2 - 50 min	**Interactive Lecture** Tutor uses**Interactive lecture** to make brief presentation on the Philosophy of the metal and automotive industries. **Discussion& Video Presentation** Tutor will use **pre-video recordings** from sources (YouTube, Khan Academy, Coursera, Udemy, MOOCs) to discussPhilosophy of the metal and automotive Industries	**Interactive Lecture** Student teachers listens, contribute to discussions and write down important points. **Discussion** Student teachers engage in discussions and do power point presentation onPhilosophy of the metal and automotive Industries
		Stage 3 - 40 min	**Discussiom& Video Presentation** Tutor will use **pre-**	**Discussiom& Video Presentation** Student teachers prepare

	challenges facing the metal and automotive industries		**video recordings** from sources (YouTube, Khan Academy, Coursera, Udemy, MOOCs) to discussHistory of metal Production	and present a report on History of metal production.
		Stage 4 - 50 min	**Group Discussion** Tutor guide students in groups to discuss Modern developments and challenges facing the metal and automotive industries	**Group Discussion** Student teachers engage in discussions and do PowerPoint presentation on the Modern developments and challenges facing the metal and automotive industries
		Stage 5 - 10 min	**Closure** Reflection of the salient parts of the lesson and Closure.	**Closure** Students reflect onthe Philosophy and history of engineering, philosophies, concepts and safe working environment in the metal and automotive industries
Lesson assessments – evaluation of learning:of, for and as learning within the lesson (linking to learning outcomes)	**Component 1 Assessment type: Assessment of Learning** **Category of Assessment**: quiz 1. Philosophy of the metal and automotiveindustries. 2. History of metal production 3. Modern developments and challenges facing the metal and automotive industries **Learning Outcomes assessed:LO1** **Weighting (40%)** **Component 2** **Assessment Type: Assessment for and as Learning** **Component 2; Continuous Assessment 1** **Category of Assessment:** Student teachers assessed through observation and contributions to class discussion, Oral Presentations such as Power-Point presentations, as well as portfolio on the lesson: 1. Philosophy of the metal and automotiveindustries. 2. History of metal production 3. Modern developments and challenges facing the metal and automotive industries **Learning Outcomes assessed: LO1** **Weighting (60%)**			
Teaching Learning Resources	1. Computers (Laptops or PCs) 2. Interactive boards 3. Internet facility			
Required Text (core)	Callister, W.D and Rethwisch, D.G (2013). Materials Science and Engineering: An Introduction 9th Edition.Wiley. Denton, T. (2014). Automobile electrical and electronic systems. Amsterdam: Butter-worth-Heinemann. Dolan, J.A. (1979). Motor vehicle technology and practical work (Parts 1 and 2). Hong Kong: HeinemannEducational Books Ltd. Sackey, J.K.N. &Amoakohene, S.K. (1996). Metalwork Technology. London, Macmillan Publications.			

Additional Reading List	Gill, P. S. (2011). A textbook of automobile engineering (vol. 1).New Delhi: S. K. Katari&Sons. Hillier, V.A.W. (1991). Fundamentals of motor vehicle technology (4th ed.). Musselburgh: Stanley Thornes Ltd. Jones, D. R.H and Ashby, M.F (2011). Engineering Materials 1, Fourth Edition: An Introduction to Properties, Applications and Design 4th Edition, Butterworth-Heinemann
CPD Needs	**1.** Documentary Analysis and discussion on Philosophy of the metal and automotive industries, History of metal production and Modern developments and challenges facing the metal and automotive industries 2. Manipulating of Interactive Board 3. Organising Class / group Discussions (THEME 3 ,5) **4.** Portfolio Building onModern developments and challenges facing the metal and automotive industries

LESSON 1

Year of B.Ed.	2	Semester	1	Place of lesson in semester	1 2 3 4 5 6 7 8 9 10 11 12

Title of Lesson	Philosophy and history of engineering, philosophies, concepts and safe working environment in the metal and automotive industries.					**Lesson Duration**	**180 minutes**
Lesson description	The lesson is to enable the student teacher to gain knowledge in personalsafety and safe working environment in the metal and automotive industries,						
Previous student teacher knowledge, prior learning (assumed)	Student-teachers are familiar with: 1.Philosophy of the metal and automotiveindustries. 2. History of metal production 3. Modern developments and challenges facing the metal and automotive industries						
Possible barriers to learning in the lesson							
Lesson Delivery – chosen to support students in achieving the outcomes	**Face-to-face☑**	**Practical Activity**	**Work-Based Leaning**	**Seminars**	**Independent Study**	**e-learning opportunities ☑**	**Practicum**
Lesson Delivery – main mode of delivery chosen to support student teachers in achieving the learning outcomes.	Use **Interactive lecture** to make brief presentation on Personal safety, Workshoprequirements and safety, Workshop hygiene and Workshop practices and ethics in the Metal and Automotive industries. Use **pre- video recordings** from sources (YouTube, Khan Academy, Coursera, Udemy, MOOCs) to discuss, prepare and present a Report on Personal safety, Workshoprequirements and safety, Workshop hygiene and Workshop practices and ethics in the Metal and Automotive industries.						
• **Purpose for the lesson, what you want the students to achieve, serves as basis for the learning outcomes. An expanded version of the description.** • **Write in full aspects of the NTS addressed**	The purpose of this lesson is to introduce student teachers toPersonal safety, Workshop requirements and safety, Workshop hygiene and Workshop practices and ethics in the Metal and Automotive industries.						
• **Learning Outcome for the lesson, picked and developed from the course specification** • **Learning indicators for each learning outcome**	**Learning Outcomes**		**Learning Indicators**		**Identify which cross-cutting issues - core and transferable skills, inclusivity, equity and addressing diversity. How will these be addressed or developed.**		
	CLO.1 Demonstrate knowledge and understanding in the relevant foundational history, philosophies, concepts and Safe Working environment in the metal and automotive industries.		1.4 Prepare a report on environment requirements for thelearning/school setting.		• critical thinking • diversity and inclusivity,		

Topic Philosophy and history of engineering, philosophies, concepts and safe working environment in the metal and automotive industries	**Topic Sub-topic**	**Stage/Time**	**Teaching and learning activitiesto achieve learning outcomes: depending on delivery mode selected. Teacher led,collaborative group work or independent study**	
			Teacher Activity	**Student Activity**
	Previous Knowledge	Stage 1 - 10 min	**Lesson Introduction** Tutor facilitates student teachers revision of previous knowledge on Philosophy of the metal and automotiveindustries, History of metal production and Modern developments and challenges facing the metal and automotive industries	**Lesson Introduction** Student teachers answer question and do brief discussions on Philosophy of the metal and automotiveindustries, History of metal production and Modern developments and challenges facing the metal and automotive industries
	Personal safety Workshop Requirementsa nd safety, Workshop hygiene Workshop practices and ethics	Stage 2 - 60 min	**Interactive Lecture** Tutor uses**Interactive lecture** to make brief presentation on Personal safety and Workshop requirements and safety OR **Discussion &Video Presentation** Tutor uses**pre- video recordings** from sources (YouTube, Khan Academy, Coursera, Udemy, MOOCs) to discuss Personal safety and Workshop requirements and safety	**Interactive Lecture** Student teachers listen, contribute to discussions and write down important points. **Discussion & Video Presentation** Student teachers engage in discussions and do power point presentation on Personal safety and Workshop requirements and safety.
		Stage 3 - 50 min	**Discussion & Video Presentation** Tutor will use **pre- video recordings** from sources (YouTube, Khan Academy, Coursera, Udemy, MOOCs) to guide student teachers to discuss Workshop hygiene	**Discussion & Video Presentation** Student teachersdiscuss,and produce a report onWorkshop hygiene
		Stage 4 - 50 min	**Group Discussion** Tutor guide students in groups to discuss Workshop practices and ethics	**Group Discussion** Student teachers engage in discussions and do PowerPoint presentation onWorkshop practices and ethics
		Stage 5 - 10 min	**Closure** Reflection and Closure.	**Closure** Students reflect on Personal safety,

				Workshoprequirements and safety, Workshop hygiene and Workshop practices and ethics.
Lesson assessments – evaluation of learning:of, for and as learning within the lesson (linking to learning outcomes)	**Component 1 Assessment type: Assessment of Learning** **Category of Assessment**: quiz 1. Personal safety, 2. Workshop requirements and safety, 3. Workshop hygiene 4. Workshop practices and ethics in the Metal and Automotive industries. **Learning Outcomes assessed: LO1** **Weighting (40%)** **Component 2** **Assessment Type: Assessment for and as Learning** **Component 2; Continuous Assessment 1** **Category of Assessment:** Student teachers assessed through observation and contributions to class discussion, **Oral Presentations such as Power-Point presentations, reports as well as portfolio** on the lesson: 1. Group presentation on Personal safety CLO1 2. Small Group Report on Workshop requirements and safety. CLO1 3. Small Group Power-Point presentations onWorkshop hygiene and Workshop practices and ethics in the Metal and Automotive industries 4. Reflection by student teachers **Learning Outcomes assessed: LO1** **Weighting (60%)**			
Teaching Learning Resources	1. Computers (Laptops or PCs) 2. Interactive boards 3. Internet facility			
Required Text (core)	Callister, W.D and Rethwisch, D.G (2013). Materials Science and Engineering: An Introduction 9th Edition.Wiley. Denton, T. (2014). Automobile electrical and electronic systems. Amsterdam: Butter-worth-Heinemann. Dolan, J.A. (1979). Motor vehicle technology and practical work (Parts 1 and 2). Hong Kong: Heinemann Educational Books Ltd. Sackey, J.K.N. &Amoakohene, S.K. (1996). Metalwork Technology. London, Macmillan Publications.			
Additional Reading List	Gill, P. S. (2011). A textbook of automobile engineering (vol. 1).New Delhi: S. K. Katari&Sons. Hillier, V.A.W. (1991). Fundamentals of motor vehicle technology (4th ed.). Musselburgh: Stanley ThornesLtd. Jones, D. R.H and Ashby, M.F (2011). Engineering Materials 1, Fourth Edition: An Introduction toProperties, Applications and Design 4th Edition, Butterworth-Heinemann			
CPD Needs	**1.** Documentary Analysis and discussion on Philosophy of the metal and automotive industries, History of metal production and Modern developments and challenges facing the metal and automotive industries 2. Manipulating of Interactive Board 3. Organising Class / group Discussions (THEME 3 ,5) **4.** Portfolio Building onModern developments and challenges facing the metal and automotive industries			

LESSON 3

Year of B.Ed.	2	Semester	1	Place of lesson in semester	1 2 3 4 5 6 7 8 9 10 11 12

Title of Lesson	Philosophy and historyof engineering, philosophies, concepts and safe workingenvironment in the metal and automotive industries.				**Lesson Duration**	**180 minutes**	
Lesson description	This lesson aim to help student teachers to acquire the skills and knowledge in Material safety i.e storage, handling, transporting, disposal, etc.						
Previous student teacher knowledge, prior learning (assumed)	Student-teachers are: • Familiar with Materials used in the Metal and Automotive Industries.						
Possible barriers to learning in the lesson							
Lesson Delivery – chosen to support students in achieving the outcomes	**Face-to-face☑**	**Practical Activity**	**Work-Based Leaning**	**Seminars**	**Independent Study**	**e-learning opportunities ☑**	**Practicum**
Lesson Delivery – main mode of delivery chosen to support student teachers in achieving the learning outcomes.	Use **Interactive lecture** to make brief presentation on Material safety i.e storage, handling, transporting, disposal, etc. Use **pre- video recordings** from sources (YouTube, Khan Academy, Coursera, Udemy, MOOCs) to discuss, prepare and present a Portfolio on Material safety i.e storage, handling, transporting, disposal, etc.						
• **Purpose for the lesson, what you want the students to achieve, serves as basis for the learning outcomes. An expanded version of the description.** • **Write in full aspects of the NTS addressed**	The purpose of this lesson is to introduce student teachers to the relevant skills and knowledge inMaterial safety i.e storage, handling, transporting, disposal, etc.						
• **Learning Outcome for the lesson, picked and developed from the course specification** • **Learning indicators for each learning outcome**	**Learning Outcomes**		**Learning Indicators**			**Identify which cross-cutting issues - core and transferable skills, inclusivity, equity and addressing diversity. How will these be addressed or developed.**	
	CLO.1 Demonstrate knowledge and understanding in the relevant foundational history, philosophies,concepts and Safe Working environment in the metal and automotive industries..		1.4 Prepare a report on environment requirements for the learning/school setting.			• critical thinking • diversity and inclusivity,	

Topic	**Topic Sub-topic**	**Stage/Time**	**Teaching and learning activitiesto achieve learning outcomes: depending on delivery mode selected. Teacher led,collaborative group work or independent study**	
			Teacher Activity	**Student Activity**
Philosophy and history of engineering, philosophies, concepts and safe working environment in the metal and automotive industries	Previous Knowledge	Stage 1 - 10 min	**Introduction** Tutor facilitates student teachers revision of previous knowledge on Materials used in the Metal and Automotive Industries	**Introduction** Student teachers answer question and do brief discussions.

	Material safetystorage handling transporting disposal, etc.	Stage 2 - 60 min	**Discussion & Video Presentation** Tutor will use **pre- video recordings** from sources (YouTube, Khan Academy, Coursera, Udemy, MOOCs) to discuss Material safety and storage	**Discussion & Video Presentation** Student teachers listen, contribute to discussions and write down important points. Student teachers engage in discussions and do power point presentation onMaterial safety andstorage.
		Stage 3 - 60 min	**Discussion & Video Presentation** Tutor will use **pre- video recordings** from sources (YouTube, Khan Academy, Coursera, Udemy, MOOCs) to discussHandling and Transporting of Materials.	**Discussion & Video Presentation** Student teachers prepare and present a Portfolio on Handling and Transporting of Materials.
		Stage 4 - 40 min	**Discussion** Tutor guide students in groups to discuss ways of disposal metal waste	**Discussion** Student teachers engage indiscussions and present a report on ways of disposing metal waste.
		Stage 5 - 10 min	**Closure** Tutor guide student teachers to Reflect on Material safety, Storage, handling, transporting and Disposal of metal waste to Close the Lesson.	**Closure** Students reflect on Material safety, Storage, handling, transporting and Disposal of metal waste.
Lesson assessments – evaluation of learning:of, for and as learning within the lesson (linking to learning outcomes)	**Component 1 Assessment type: Assessment of Learning** **Category of Assessment**: quiz Material safety, Storage, handling, transporting and Disposal of metal waste **Learning Outcomes assessed: LO2** **Weighting (40%)** **Component 2** **Assessment Type: Assessment for and as Learning** **Component 2; Continuous Assessment 1** **Category of Assessment:** Student teachers assessed through observation and contributions to class discussion, **Oral Presentations such as Power-Point presentations, as well as portfolio** on the lesson: 1. Group presentation onMaterial safety, Storage, handling, transporting and Disposal of metal waste CLO1 2. Small Group report writing on Material safety, Storage, handling, transporting and Disposal of metal waste CLO1 3. Reflection by student teachers **Learning Outcomes assessed: LO2** **Weighting (60%)**			
Teaching Learning Resources	1. Computers (Laptops or PCs) 2. Interactive boards			

	3. Internet facility
Required Text (core)	Callister, W.D and Rethwisch, D.G (2013). Materials Science and Engineering: An Introduction 9th Edition.Wiley. Denton, T. (2014). Automobile electrical and electronic systems. Amsterdam: Butter-worth-Heinemann. Dolan, J.A. (1979). Motor vehicle technology and practical work (Parts 1 and 2). Hong Kong: Heinemann Educational Books Ltd. Sackey, J.K.N. &Amoakohene, S.K. (1996). Metalwork Technology. London, Macmillan Publications
Additional Reading List	Gill, P. S. (2011). A textbook of automobile engineering (vol. 1).New Delhi: S. K. Katari&Sons. Hillier, V.A.W. (1991). Fundamentals of motor vehicle technology (4th ed.). Musselburgh: Stanley Thornes Ltd. Jones, D. R.H and Ashby, M.F (2011). Engineering Materials 1, Fourth Edition: An Introduction to Properties, Applications and Design 4th Edition, Butterworth-Heinemann
CPD Needs	Skills in Material safety, Storage, handling, transporting and Disposal of metal waste.

LESSON 4

Year of B.Ed.	2	Semester	1	Place of lesson in semester	1 2 3 4 5 6 7 8 9 10 11 12

Title of Lesson	Materials used in the Metal and Automotive Industries				**Lesson Duration**		**180 minutes**
Lesson description	This lesson aim to help student teachers to acquire the relevantknowledge onMaterials used in the Metal and Automotive Industries -Metals- a. Ferrous Metals (Cast iron and Steel), b. Non-ferrous metal, c. Alloys, d. Properties (mechanical, Physicaland Chemical), e. Methods of identifying metal						
Previous student teacher knowledge, prior learning (assumed)	Student-teachers are: Familiar with Material safety, Storage, handling, transporting and Disposal of metal waste						
Possible barriers to learning in the lesson							
Lesson Delivery – chosen to support students in achieving the outcomes	**Face-to-face☑**	**Practical Activity**	**Work-Based Leaning**	**Seminars**	**Independent Study**	**e-learning opportunities ☑**	**Practicum**
Lesson Delivery – main mode of delivery chosen to support student teachers in achieving the learning outcomes.	Use **Interactive lecture** to make brief presentation on the relevant knowledge on Metals- a. Ferrous Metals (Cast iron and Steel), b. Non-ferrous metal, c. Alloys, d. Properties (mechanical, Physicaland Chemical), e. Methods of identifying metals Use **pre- video recordings** from sources (YouTube, Khan Academy, Coursera, Udemy, MOOCs) to discuss, prepare and present a Portfolio on Metals a. Ferrous Metals (Cast iron and Steel), b. Non-ferrous metal, c. Alloys, d. Properties (mechanical, Physicaland Chemical), e. Methods of identifying metals						
• **Purpose for the lesson, what you want the students to achieve, serves as basis for the learning outcomes. An expanded version of the description.** • **Write in full aspects of the NTS addressed**	The purpose of this lesson is to introduce student teachers to the knowledge in Metals a. Ferrous Metals (Cast iron and Steel) b. Non-ferrous metal c. Alloys d. Properties (mechanical, Physical and Chemical) e. Methods of identifying metals						
• **Learning Outcome for the lesson, picked and developed from the course specification** • **Learning indicators for each learning outcome**	**Learning Outcomes**		**Learning Indicators**		**Identify which cross-cutting issues - core and transferable skills, inclusivity, equity and addressing diversity. How will these be addressed or developed.**		
	CLO 2. Exhibit knowledge and skills in the processes and proper use of training materials in the metal and automotive industries. (NTS pg. 10, NTECF pg. 29).		2.1 Make a portfolio on the training materials used in the metal and automotive industries		• Creativity • critical thinking • diversity and inclusivity, • information literacy,		

Topic Materials used in the Metal and Automotive Industries	**Topic** **Sub-topic**	**Stage/Time**	**Teaching and learning activities to achieve learning outcomes: depending on delivery mode selected. Teacher led,collaborative group work or independent study**	
			Teacher Activity	**Student Activity**
	Previous Knowledge	Stage 1 - 10 min	**Lesson Introduction** Tutor facilitates student teachers revision of previous knowledge on Material safety, Storage, handling, transporting and Disposal of metal waste .	**Lesson Introduction** Student teachers answer question and do brief discussions.
	Metals a. Ferrous Metals (Cast iron and Steel) b. Non-ferrous metal c. Alloys d. Properties (mechanical, Physical and Chemical) e. Methods of identifying metals	Stage 2 - 60 min	**Interactive Lecture** Tutor uses**Interactive lecture** to make brief presentation on Ferrous Metals (Cast iron and Steel) OR **Video Presentation & Discussion** Tutor will use **pre-video recordings** from sources (YouTube, Khan Academy, Coursera, Udemy, MOOCs) toDiscuss the production processes of ferrous metals (pig iron, cast iron and steel)	**Interactive Lecture** Student teachers listen, contribute to discussions and write down important points. **Video Presentation & Discussion** Student teachers engage in discussions and do power point presentation onthe production processes of ferrous metals (pig iron, cast iron andsteel)
		Stage 3 - 60 min	**Discussion & Video Presentation** Tutor will use **pre-video recordings** from sources (YouTube, Khan Academy, Coursera, Udemy, MOOCs) to discussNon-ferrous metal and Alloys	**Discussion & Video Presentation** Student teachers discuss and present a Portfolio on Non-ferrous metal and Alloys
		Stage 4 - 40 min	**Group Discussion** Tutor guide students in groups to discuss Properties (mechanical, Physical and Chemical) and Methods of identifying metals	**Group Discussion** Student teachers engage in discuss and present a report on Properties (mechanical, Physical and Chemical) and Methods of identifying metals
		Stage 5 - 10 min	**Closure** Tutor present reflection on properties of metals (Mechanical, Physical andChemical) and close lesson .	**Closure** Students reflect onProperties of metals(mechanical, Physical and Chemical.

Lesson assessments – evaluation of learning:of, for and as learning within the lesson (linking to learning outcomes)	**Component 1 Assessment type: Assessment of Learning** **Category of Assessment**: quiz a. Ferrous Metals (Castiron and Steel) b. Non-ferrous metal c. Alloys d. Properties (mechanical, Physical and Chemical) e. Methods of identifying metal **Learning Outcomes assessed: LO2** **Weighting (40%)** **Component 2** **Assessment Type: Assessment for and as Learning** **Component 2; Continuous Assessment 1** **Category of Assessment:** Student teachers assessed through observation and contributions to class discussion, **Oral Presentations such as Power-Point presentations, as well as portfolio** on the lesson: a. Ferrous Metals (Castiron and Steel) b. Non-ferrous metal c. Alloys d. Properties (mechanical, Physical and Chemical) e. Methods of identifying metal. CLO2 f. Reflection by student teachers **Learning Outcomes assessed: LO2** **Weighting (60%)**
Teaching Learning Resources	1. Computers (Laptops or PCs) 2. Interactive boards 3. Internet facility
Required Text (core)	Callister, W.D and Rethwisch, D.G (2013). Materials Science and Engineering: An Introduction 9th Edition.Wiley. Denton, T. (2014). Automobile electrical and electronic systems. Amsterdam: Butter-worth-Heinemann. Dolan, J.A. (1979). Motor vehicle technology and practical work (Parts 1 and 2). Hong Kong: HeinemannEducational Books Ltd. Sackey, J.K.N. &Amoakohene, S.K. (1996). Metalwork Technology. London, Macmillan Publications
Additional Reading List	Gill, P. S. (2011). A textbook of automobile engineering (vol. 1).New Delhi: S. K. Katari&Sons. Hillier, V.A.W. (1991). Fundamentals of motor vehicle technology (4th ed.). Musselburgh: Stanley Thornes Ltd. Jones, D. R.H and Ashby, M.F (2011). Engineering Materials 1, Fourth Edition: An Introduction to Properties, Applications and Design 4th Edition, Butterworth-Heinemann
CPD Needs	1. Skills in of identifying metals 2. Skills in the production processes of ferrous metals (pig iron, cast iron and steel)

LESSON 5

Year of B.Ed.	2	Semester	1	Place of lesson in semester	1 2 3 4 5 6 7 8 9 10 11 12

Title of Lesson	Materials used in the Metal and Automotive Industries				**Lesson Duration**	**180 minutes**	
Lesson description	The lesson aim at introducing the student teacher to the processes used to produce artifacts in the metal and automotive industries and also perform practical work in the workshop.Student teachers will be required to undertake various projects and produce artifacts. In the process of designing andproducing the artifacts, the teacher must be introduced to relevant issues of equity and inclusivity within the industry as well as the concept of greening TVET by way of considering recycling, re-designing or re-using waste						
Previous student teacher knowledge, prior learning (assumed)	Student-teachers areFamiliar with: a.Ferrous Metals (Castiron and Steel) b. Non-ferrous metal c. Alloys d. Properties (mechanical, Physical and Chemical) and e. Methods of identifying metals						
Possible barriers to learning in the lesson	Difficulty in acquiring samples of metals						
Lesson Delivery – chosen to support students in achieving the outcomes	**Face-to-face☑**	**Practical Activity**	**Work-Based Leaning**	**Seminars**	**Independent Study**	**e-learning opportunities ☑**	**Practicum**
Lesson Delivery – main mode of delivery chosen to support student teachers in achieving the learning outcomes.	Use **Interactive lecture** to make brief presentation on skills in Heat treatment of metals, Forms of metal and Application of metals. Use **pre- video recordings** from sources (YouTube, Khan Academy, Coursera, Udemy, MOOCs) to discuss, design and prepare a project workonHeat treatment of metals, Forms of metal and Application of metals.						
• **Purpose for the lesson, what you want the students to achieve, serves as basis for the learning outcomes. An expanded version of the description.** • **Write in full aspects of the NTS addressed**	The purpose of this lesson is to introduce student teachers to the skills in Heat treatment of metals, Forms of metal and Application of metals.						
• **Learning Outcome for the lesson, picked and developed from the course specification** • **Learning indicators for each learning outcome**	**Learning Outcomes**		**Learning Indicators**		**Identify which cross-cutting issues - core and transferable skills, inclusivity, equity and addressing diversity. How will these be addressed or developed.**		
	CLO 2. Exhibit knowledge and skills in the processes and proper use of training materials in the Metal and Automotive Industries. (NTS pg. 10, NTECF pg. 29)		2.1Make a portfolio on the training materials used in the Metal and Automotive Industries. 2.2 Prepare a project work involving the use of materials in the Metal and Automotive industries		• Creativity • critical thinking • skills in Heat treatment		

<table>
<tr><td rowspan="7">Topic

Materials used in the Metal and Automotive Industries</td><td rowspan="2">Topic
Sub-topic</td><td rowspan="2">Stage/Time</td><td colspan="2">Teaching and learning activitiesto achieve learning outcomes: depending on delivery mode selected. Teacher led,collaborative group work or independent study</td></tr>
<tr><td>Teacher Activity</td><td>Student Activity</td></tr>
<tr><td>Previous Knowledge</td><td>Stage 1 - 10 min</td><td>Introduction
Tutor facilitates student teachers revision of previous knowledge on with principles guiding Working Drawings and merits of Working Drawings</td><td>Introduction
Student teachers answer question and do brief discussions.</td></tr>
<tr><td>Heat treatment of
metals
2.Forms of metal
3.Application of metals.</td><td>Stage 2 - 60 min</td><td>Brainstorming
Teacher facilitate student teacher transition to the new lesson onHeat Treatment of Metalswith the use of ‘know-want to know and learnt’ (KWL).
OR
Video Presentation & Discussion
Tutor will use pre- video recordings from sources (YouTube, Khan Academy, Coursera, Udemy, MOOCs) to discussHeat Treatment of Metals.</td><td>Brainstorming
Student teachers fillfirst two columns of Know-want to know and learnt (KWL) form and share to class with respect to what they already know about the topic and what they want to learn from the lesson.

Video Presentation & Discussion
Student teachers engage in discussions and do power point presentation on Heat treatment of metals.</td></tr>
<tr><td>Stage 3 - 40 min</td><td>Video Presentation
Tutor will use pre- video recordings from sources (YouTube, Khan Academy, Coursera, Udemy, MOOCs) to Forms of Metal</td><td>Video Presentation
Student teachers prepare and present models of Forms of Metals</td></tr>
<tr><td>Stage 4 - 60 min</td><td>Group Discussion
Tutor guide students in groups to discuss, design and realise artefacts in metals-Application of Metals.</td><td>Group Discussion
Student teachers engage in discussions design and realise artefacts in metals</td></tr>
<tr><td>Stage 5 - 10 min</td><td>Closure
Tutor presents Reflection on Heat treatment of metals, Forms of metal and Application of metals to close.</td><td>Closure
Students reflect on the Heat treatment of metals, Forms of metal and Application of metals.</td></tr>
<tr><td>Lesson assessments – evaluation of learning:of, for and as learning within the lesson (linking to learning outcomes)</td><td colspan="3">Component 1 Assessment type: Assessment of Learning

Category of Assessment: quiz

1. Heat treatment of metals
2. Forms of metal
3. Application of metals.
Learning Outcomes assessed: LO2
Weighting (40%)

Component 2
Assessment Type: Assessment for and as Learning</td></tr>
</table>

	Component 2; Continuous Assessment 1 **Category of Assessment:** Student teachers assessed through observation and contributions to class discussion, Oral Presentations such as Power-Point presentations, as well as Project work on the lesson: 1. Heat treatment of Metals 2. Forms of metal 3. Application of metals.CLO2 4. Reflection by student teachers **Learning Outcomes assessed: LO2** **Weighting (60%)**
Teaching Learning Resources	1. Computers (Laptops or PCs) 2. Interactive boards 3. Internet facility 4. Cardboard paper 5. Wooden boards 6. Metal (Sheet metal, pipes, tubes) etc.
Required Text (core)	Callister, W.D and Rethwisch, D.G (2013). Materials Science and Engineering: An Introduction 9th Edition.Wiley. Denton, T. (2014). Automobile electrical and electronic systems. Amsterdam: Butter-worth-Heinemann. Dolan, J.A. (1979). Motor vehicle technology and practical work (Parts 1 and 2). Hong Kong: Heinemann Educational Books Ltd. Sackey, J.K.N. &Amoakohene, S.K. (1996). Metalwork Technology. London, Macmillan Publications
Additional Reading List	Gill, P. S. (2011). A textbook of automobile engineering (vol. 1).New Delhi: S. K. Katari&Sons. Hillier, V.A.W. (1991). Fundamentals of motor vehicle technology (4th ed.). Musselburgh: Stanley Thornes Ltd. Jones, D. R.H and Ashby, M.F (2011). Engineering Materials 1, Fourth Edition: An Introduction to Properties, Applications and Design 4th Edition, Butterworth-Heinemann
CPD Needs	a) Skills in designing and making artefacts in metals

LESSON 6

Year of B.Ed.	2	Semester	1	Place of lesson in semester	1 2 3 4 5 6 7 8 9 10 11 12

Title of Lesson	Materials used in the Metal and AutomotiveIndustries			**Lesson Duration**	**180 minutes**		
Lesson description	The lesson aim at equipping the student teacher with requisite knowledge and skills in themetal and automotive industries. The student teacher will be introduced to Plastic materials and processes used for artefacts in the metal and automotive industries and also perform practical work in the workshop						
Previous student teacher knowledge, prior learning (assumed)	Student-teachers are familiar with: 1. Heat treatment of Metals 2. Forms of metal 3. Application of metals						
Possible barriers to learning in the lesson							
Lesson Delivery – chosen to support students in achieving the outcomes	**Face-to-face☑**	**Practical Activity**	**Work-Based Leaning**	**Seminars**	**Independent Study**	**e-learning opportunities ☑**	**Practicum**
Lesson Delivery – main mode of delivery chosen to support student teachers in achieving the learning outcomes.	Use **Interactive lecture** to make brief presentation on basic manipulative skills in Scale Modelling of Designs Use **pre- video recordings** from sources (YouTube, Khan Academy, Coursera, Udemy, MOOCs) to discuss, prepare and present a Portfolio on Scale Modelling of Designs						
• **Purpose for the lesson, what you want the students to achieve, serves as basis for the learning outcomes. An expanded version of the description.** • **Write in full aspects of the NTS addressed**	The purpose of this lesson is to provide student teachers with the relevant knowledge on Plastics – a.Thermoplastics, b.Thermosetting, c. Properties and d. Problemsassociated plasticdisposal						
• **Learning Outcome for the lesson, picked and developed from the course specification** • **Learning indicators for each learning outcome**	**Learning Outcomes**		**Learning Indicators**		**Identify which cross-cutting issues - core and transferable skills, inclusivity, equity and addressing diversity. How will these be addressed or developed.**		
	CLO 2. Exhibit knowledge and skills in theprocesses and proper use of training materials in the metal and automotive industries. (NTS pg. 10, NTECF pg. 29)		2.1 Make a portfolio on the training materials used in the metal and automotive industries. 2.2 Prepare a project work involving the use of materials in the metal and automotive industries		• Creativity • critical thinking • diversity and inclusivity, • skills in design and make artefacts in Plastics		

<table>
<tr><td rowspan="6">Topic

Materials used in the Metal and Automotive Industries</td><td rowspan="2">Topic
Sub-topic</td><td rowspan="2">Stage/Time</td><td colspan="2">Teaching and learning activitiesto achieve learning outcomes: depending on delivery mode selected. Teacher led,collaborative group work or independent study</td></tr>
<tr><td>Teacher Activity</td><td>Student Activity</td></tr>
<tr><td>Previous Knowledge</td><td>Stage 1 - 10 min</td><td>Introduction
Tutor facilitates student teachers revision of previous knowledge on Heat treatment of Metals, Forms of metal
andApplication of metals.</td><td>Introduction
Student teachers answer question and do brief discussions.</td></tr>
<tr><td>Plastics

Thermoplastics</td><td>Stage 2 - 60 min</td><td>Video Presentation & Discussion
Tutor will use pre- video recordings from sources (YouTube, Khan Academy, Coursera, Udemy, MOOCs) to discussThermoplastics plastics and their Properties</td><td>Video Presentation & Discussion
Student teachers engage in discussions and do power point presentation onThermoplastics
and their properties.</td></tr>
<tr><td>Thermosetting Properties</td><td>Stage 3 - 60 min</td><td>Video Presentation & Discussion
Tutor will use pre- video recordings from sources (YouTube, Khan Academy, Coursera, Udemy, MOOCs) to discussThermosetting plastics and their properties.</td><td>Video Presentation & Discussion
Student teachers discuss, prepare and present portfolio onThermosetting plastics and their properties</td></tr>
<tr><td rowspan="2">Problems associated plastic disposal</td><td>Stage 4 - 40 min</td><td>Group Discussion
Tutor guide students in groups to discuss Problems associated with disposal Plastics.</td><td>Group Discussion
Student teachers engage in discussions and present report on Problems associated with Disposal of Plastics.</td></tr>
<tr><td>Stage 5 - 10 min</td><td>Closure
Tutor gives Reflection on Thermoplastics and their Properties,
b.Thermosetting and their Properties, c.Problems associated with disposal of Plastics to close lesson.</td><td>Closure
Students reflect onThermoplastics and their Properties,
b.Thermosetting and their Properties, c.Problems associated with disposal of Plastics.</td></tr>
<tr><td>Lesson assessments – evaluation of learning:of, for and as learning within the lesson (linking to learning outcomes)</td><td colspan="4">Component 1 Assessment type: Assessment of Learning

Category of Assessment: quiz

a.Thermoplastics and their Properties
b.Thermosetting and their Properties
c.Problems associated disposal of Plastics

Learning Outcomes assessed: LO2
Weighting (40%)

Component 2
Assessment Type: Assessment for and as Learning
Component 2; Continuous Assessment 1
Category of Assessment:
Student teachers assessed through observation and contributions to class discussion, Oral</td></tr>
</table>

	Presentations such as Power-Point presentations, Report writing, as well as Portfolio on the lesson: a. Thermoplastics and their Properties b.Thermosetting and their Properties c.Problems associated disposal of Plastics d. Reflection by student teachers **Learning Outcomes assessed: LO2** **Weighting (60%)**
Teaching Learning Resources	1. Computers (Laptops or PCs) 2. Interactive boards 3. Internet facility 4. Plastic materials (Sheet, granules, etc,)
Required Text (core)	Callister, W.D and Rethwisch, D.G (2013). Materials Science and Engineering: An Introduction 9th Edition.Wiley. Denton, T. (2014). Automobile electrical and electronic systems. Amsterdam: Butter-worth-Heinemann. Dolan, J.A. (1979). Motor vehicle technology and practical work (Parts 1 and 2). Hong Kong: Heinemann Educational Books Ltd. Sackey, J.K.N. &Amoakohene, S.K. (1996). Metalwork Technology. London, Macmillan Publications
Additional Reading List	Gill, P. S. (2011). A textbook of automobile engineering (vol. 1).New Delhi: S. K. Katari&Sons. Hillier, V.A.W. (1991). Fundamentals of motor vehicle technology (4th ed.). Musselburgh: Stanley Thornes Ltd. Jones, D. R.H and Ashby, M.F (2011). Engineering Materials 1, Fourth Edition: An Introduction toProperties, Applications and Design 4th Edition, Butterworth-Heinemann
CPD Needs	a) Documentary Analysis and discussion on disposal of plastics

LESSON 1

Year of B.Ed.	2	Semester	1	Place of lesson in semester	1 2 3 4 5 6 7 8 9 10 11 12

Title of Lesson	Materials used in the Metal and Automotive Industries				**Lesson Duration**	**180 minutes**	
Lesson description	This lesson aim at equipping student learners with the skills in Manufacturing Processes of Plastics.Thus, the lesson emphasizes problem-solving, critical thinking, creative skills and interest in hands-on activities.Student teachers will be required to undertake various projects and produce artefacts in plastics. In the process of designing and producing the artefacts, the teacher must be introduced to relevant issues of equity and inclusivity within the industry aswell as the concept of greening TVET by way of considering recycling, re-designing or re-using plastic waste.						
Previous student teacher knowledge, prior learning (assumed)	Student-teachers are familiar with: a.Thermoplastics and their Properties b.Thermosetting and their Properties c.Problems associated disposal of Plastics						
Possible barriers to learning in the lesson							
Lesson Delivery – chosen to support students in achieving the outcomes	**Face-to-face☑**	**Practical Activity ☑**	**Work-Based Leaning**	**Seminars**	**Independent Study**	**e-learning opportunities ☑**	**Practicum**
Lesson Delivery – main mode of delivery chosen to support student teachers in achieving the learning outcomes.	Use **Interactive lecture** to make brief presentation on the relevant knowledge and skills in the Manufacturing Processes of Plastics 1. Extrusion 2. Injection moulding 3. Compression 4. Blow. Use **pre- video recordings** from sources (YouTube, Khan Academy, Coursera, Udemy, MOOCs) to discuss, prepare and present a Portfolio on the Manufacturing Processes of Plastics 1. Extrusion 2. Injection moulding 3. Compression 4. Blow forming						
• **Purpose for the lesson, what you want the students to achieve, serves as basis for the learning outcomes. An expanded version of the description.** • **Write in full aspects of the NTS addressed**	The purpose of this lesson is to introduce student teachers to the relevant knowledge and skills in the ManufacturingProcesses of Plastics 1. Extrusion 2. Injection moulding 3. Compression 4. Blow						
• **Learning Outcome for the lesson, picked and developed from the course specification** • **Learning indicators for each learning outcome**	**Learning Outcomes**		**Learning Indicators**		**Identify which cross-cutting issues - core and transferable skills, inclusivity, equity and addressing diversity. How will these be addressed or developed.**		
	CLO 2. Exhibit knowledge and skills in the processes and proper use of training materials in the metal and automotive industries. (NTS pg. 10, NTECF pg. 29)		2.1 Make a portfolio on the training materials used in the metal and automotive industries. 2.2 Prepare a project work involving the use of materials in the metal and automotive industries..		• Creativity • critical thinking • diversity and inclusivity, • skills in the realization process of Plastics		

Topic Materials used in the Metal and Automotive Industries	**Topic** **Sub-topic**	**Stage/Time**	**Teaching and learning activitiesto achieve learning outcomes: depending on delivery mode selected. Teacher led,collaborative group work or independent study**	
			Teacher Activity	**Student Activity**
	Previous Knowledge	Stage 1 - 10 min	**Introduction** Tutor facilitates student teachers revision of previous knowledge on Thermoplastics and their Properties, Thermosetting and their Properties and Problems associated disposal of Plastics	**Introduction** Student teachers answer question and do brief discussions.
	Manufac-turing Processes of Plastics 1. Extrusion 2. Injection moulding 3. Compression/ Press forming 4. Blow	Stage 2 - 60 min	**Interactive Lecture** Tutor uses**Interactive lecture** to make brief presentation on Manufacturing Processes of Plastics- Extrusion OR **Video Presentation, Demonstration & Discussion** Tutor will **Use Video(s) from Internet sources** (YouTube, Khan Academy, Coursera, Udemy, MOOCs) to discuss and demonstrate theManufacturing Processes of Plastics- Extrusion.	**Interactive Lecture** Student teachers listen, contribute to discussions and write down important points. **Video Presentation, Demonstration & Discussion** Student teachers engage in discussions, demonstration and production of objects using the Extrusionprocesses of Plastics
		Stage 3 - 60 min	**Video Presentation, Demonstration & Discussion** Tutor will use **pre- video recordings** from sources (YouTube, Khan Academy, Coursera, Udemy, MOOCs) to discuss and demonstrate process of Injection moulding of Plastics	**Video Presentation, Demonstration & Discussion** Student teachers prepare and realise artefacts using the process of Injection moulding of Plastics
		Stage 4 - 40 min	**Group Discussion** Tutor guide students in groups to discuss anduseCompressionand Blow forming in making artefacts in plastics.	**Group Discussion** Student teachers engage in discussions and do project work using Compressionand Blow forming in making artefacts in plastics.
		Stage 5 - 10 min	**Closure** Tutor Reflects on the Extrusion, Injection moulding,Compression/ Press formingand Blow forming, in making artefacts in plastics to close the lesson.	**Closure** Students reflect on the Extrusion, Injection moulding,Compression/ Press formingand Blow forming, in making artefacts in plastics

Lesson assessments – evaluation of learning:of, for and as learning within the lesson (linking to learning outcomes)	**Component 1 Assessment type: Assessment of Learning** **Category of Assessment**: quiz Manufacturing Processes of Plastics 1. Extrusion 2. Injection moulding 3. Compression/ Press forming 4. Blow **Learning Outcomes assessed: LO2** **Weighting (40%)** **Component 2** **Assessment Type: Assessment for and as Learning** **Component 2; Continuous Assessment 1** **Category of Assessment:** Student teachers assessed through observation and contributions to class discussion, Oral Presentations such as Power-Point presentations, as well as Project work on the lesson: Manufacturing Processes of Plastics 1. Extrusion 2. Injection moulding 3. Compression/Press forming 4. Blow 5. Reflection by student teachers. **Learning Outcomes assessed: LO2** **Weighting (60%)**
Teaching Learning Resources	1. Computers (Laptops or PCs) 2. Interactive boards 3. Internet facility 4. Plastic Materials (sheet, granules, etc)
Required Text (core)	Callister, W.D and Rethwisch, D.G (2013). Materials Science and Engineering: An Introduction 9th Edition.Wiley. Denton, T. (2014). Automobile electrical and electronic systems. Amsterdam: Butter-worth-Heinemann. Dolan, J.A. (1979). Motor vehicle technology and practical work (Parts 1 and 2). Hong Kong: Heinemann Educational Books Ltd. Sackey, J.K.N. &Amoakohene, S.K. (1996). Metalwork Technology. London, Macmillan Publications
Additional Reading List	Gill, P. S. (2011). A textbook of automobile engineering (vol. 1).New Delhi: S. K. Katari&Sons. Hillier, V.A.W. (1991). Fundamentals of motor vehicle technology (4th ed.). Musselburgh: Stanley Thornes Ltd. Jones, D. R.H and Ashby, M.F (2011). Engineering Materials 1, Fourth Edition: An Introduction to Properties, Applications and Design 4th Edition, Butterworth-Heinemann
CPD Needs	Skills in Manufacturing processes in Plastics

LESSON 8

Year of B.Ed.	2	Semester	1	Place of lesson in semester	1 2 3 4 5 6 7 **8** 9 10 11 12

Title of Lesson	**Tools, Machine; and Metal Work Joining Processes**				**Lesson Duration**	**180 minutes**	
Lesson description	This lesson aim at equipping student learners with the knowledge and skill in the use of Tools/ equipment in the metal and automotive industries.						
Previous student teacher knowledge, prior learning (assumed)	Student-teachers are familiar with: Manufacturing Processes of Plastics 1. Extrusion 2. Injection moulding 3. Compression/Press forming 4. Blow						
Possible barriers to learning in the lesson							
Lesson Delivery – chosen to support students in achieving the outcomes	**Face-to-face☑**	**Practical Activity**	**Work-Based Leaning**	**Seminars**	**Independent Study**	**e-learning opportunities ☑**	**Practicum**
Lesson Delivery – main mode of delivery chosen to support student teachers in achieving the learning outcomes.	Use **Interactive lecture** to make brief presentation on the relevant knowledge and skills in Tools, Machine; and Metal Work Joining Processes. Use **pre- video recordings** from sources (YouTube, Khan Academy, Coursera, Udemy, MOOCs) to discuss, prepare and present a Portfolio on the Tools, Machine; and Metal Work Joining Processes						
• **Purpose for the lesson, what you want the students to achieve, serves as basis for the learning outcomes. An expanded version of the description.** • **Write in full aspects of the NTS addressed**	The purpose of this lesson is to introduce student teachers to the relevant knowledge and skills in the use ofTools, Machine; and Metal Work Joining Processes						
• **Learning Outcome for the lesson, picked and developed from the course specification** • **Learning indicators for each learning outcome**	**Learning Outcomes**		**Learning Indicators**		**Identify which cross-cutting issues - core and transferable skills, inclusivity, equity and addressing diversity. How will these be addressed or developed.**		
	CLO.3 Demonstrate knowledge and skills in the processes and proper use of tools, equipment and machines in the metal and automotive industries. (NTS pg. 10, NTECF pg. 29)		3.1 Use and operate tools, equipment and machines in the metal and automotive industries.		• Creativity • critical thinking • skills in operating tools, equipment and machines in the metal and automotive industries.		

Topic Tools, Machine; and Metal Work Joining Processes	**Topic** **Sub-topic**	**Stage/Time**	**Teaching and learning activitiesto achieve learning outcomes: depending on delivery mode selected. Teacher led,collaborative group work or independent study**	
			Teacher Activity	**Student Activity**
	Previous Knowledge	Stage 1 - 10 min	**Introduction** Tutor facilitates student teachers revision of previous knowledge on Manufacturing Processes of Plastics 1. Extrusion 2. Injection moulding 3. Compression/Press forming 4. Blow	**Introduction** Student teachers answer question and do brief discussions.
	Identification and uses of 1.measuring tools 2. marking out tools 3. Holding tools 4.Striking tools 5.Cutting tools o Files o Chisels o Hacksaws 6.Finishing tools and processes	Stage 2 - 60 min	**Interactive Lecture** Tutor uses**Interactive lecture** to make brief presentation Identification of Tools/Equipment-Measuring, Marking and Holding OR **Video Presentation & Discussion** Tutor will use **pre- video recordings** from sources (YouTube, Khan Academy, Coursera, Udemy, MOOCs) to Discuss and present manipulative skills on Measuring, Marking, Holding and StrikingTools/Equipment	**Interactive Lecture** Student teachers listen, contribute to discussions and write down important points. **Video Presentation & Discussion** Student teachers engage in discussions and do power point presentation on uses of types ofTools/Equipment. Measuring, Marking, Holding and Striking.
		Stage 3 - 60 min	**Video Presentation & Discussion** Tutor will use **pre- video recordings** from sources (YouTube, Khan Academy, Coursera, Udemy, MOOCs) to discuss the characteristicsof Identified Cutting tools Files, Chisels and Hacksaws Present video from Internet sources to demonstrate filing methods (cross and drawfiling)	**Video Presentation & Discussion** Student teachers prepare and present a Portfolio on thecharacteristics of IdentifiedCutting tools Files, Chisels and Hacksaws Present a project work to demonstrate filing methods (cross and draw filing)
		Stage 4 - 40 min	**Group Discussion** Tutor guide students in groups to discuss uses of IdentifiedFinishing tools and Processes	**Group Discussion** Student teachers engage in discussions and do PowerPoint presentation on uses of Finishing tools and Processes
		Stage 5 - 10 min	**Closure** Tutor gives reflection on the types, characteristics and	**Closure** Students reflect on the types,characteristics and uses

			uses of IdentifiedTools/Equipment in the Metal and Automobile industries.	ofIdentifiedTools/Equipment in the Metal and Automobile industries
Lesson assessments – evaluation of learning:of, for and as learning within the lesson (linking to learning outcomes)	**Component 1 Assessment type: Assessment of Learning** **Category of Assessment**: quiz 1. Types of Tools /Equipment in Metal and Automobile industries 2. Characteristics of Identified Tools /Equipment. Metal and Automobile industries. 3. Uses of Identified Tools /Equipment. Metal and Automobile industries. **Learning Outcomes assessed: LO3** **Weighting (40%)** **Component 2** **Assessment Type: Assessment for and as Learning** **Component 2; Continuous Assessment 1** **Category of Assessment:** Student teachers assessed through observation and contributions to class discussion, **Oral Presentations such as Power-Point presentations, as well as portfolio** on the lesson: 1. Group presentation of Portfolio on types of Tools /Equipment. in Metal and Automobile industries.CLO3 2. Small Group PowerPoint presentation on characteristics and 3. uses of Identified Tools /Equipment. in Metal and Automobile industries).CLO3 4. Reflection by student teachers **Learning Outcomes assessed: LO3** **Weighting (60%)**			
Teaching Learning Resources	1. Computers (Laptops or PCs) 2. Interactive boards 3. Internet facility 4. Tools /Equipment. in Metal and Automobile industries.CLO3			
Required Text (core)	Callister, W.D and Rethwisch, D.G (2013). Materials Science and Engineering: An Introduction 9th Edition.Wiley. Denton, T. (2014). Automobile electrical and electronic systems. Amsterdam: Butter-worth-Heinemann. Dolan, J.A. (1979). Motor vehicle technology and practical work (Parts 1 and 2). Hong Kong: Heinemann Educational Books Ltd. Sackey, J.K.N. &Amoakohene, S.K. (1996). Metalwork Technology. London, Macmillan Publications			
Additional Reading List	Gill, P. S. (2011). A textbook of automobile engineering (vol. 1).New Delhi: S. K. Katari&Sons. Hillier, V.A.W. (1991). Fundamentals of motor vehicle technology (4th ed.). Musselburgh: Stanley Thornes Ltd. Jones, D. R.H and Ashby, M.F (2011). Engineering Materials 1, Fourth Edition: An Introduction to Properties, Applications and Design 4th Edition, Butterworth-Heinemann			
CPD Needs	1. Documentary Analysis and discussion on Types, Characteristics and Uses of Identified Tools /Equipment. Tools /Equipment. in Metal and Automobile industries.			

LESSON 9

Year of B.Ed.	2	Semester	1	Place of lesson in semester	1 2 3 4 5 6 7 8 **9** 10 11 12

Title of Lesson	Tools, Machine; and Metal Work Joining Processes			**Lesson Duration**	**180 minutes**		
Lesson description	This lesson is to equip the student teacher with requisite knowledge and understanding of the skills in the metal and automotive industries. The student teacher will be introduced to tools/equipment, materials and processes used for artefacts in the metal and automotive industries and also perform practical work in the workshop. Thus, the lesson emphasizes problem-solving, critical thinking, creative skills and interest in hands-on activities.						
Previous student teacher knowledge, prior learning (assumed)	Student-teachers are: • Familiar with the Types and Uses of tools/ machines in the metal and automotive industries.						
Possible barriers to learning in the lesson							
Lesson Delivery – chosen to support students in achieving the outcomes	**Face-to-face** ☑	**Practical Activity** ☑	**Work-Based Leaning**	**Seminars**	**Independent Study**	**e-learning opportunities** ☑	**Practicum**
Lesson Delivery – main mode of delivery chosen to support student teachers in achieving the learning outcomes.	Use **Interactive lecture** to make brief presentation on the relevant knowledge and skills in the use of Tools, Machine; and Metal Work Joining Processes. Use **pre- video recordings** from sources (YouTube, Khan Academy, Coursera, Udemy, MOOCs) to discuss, prepare and present a Portfolio on the Tools, Machine; and Metal Work Joining Processes.						
• **Purpose for the lesson, what you want the students to achieve, serves as basis for the learning outcomes. An expanded version of the description.** • **Write in full aspects of the NTS addressed**	The purpose of this lesson is to introduce student teachers to the relevant knowledge and skills in the use of Tools, Machine; and Metal Work Joining Processes.						
• **Learning Outcome for the lesson, picked and developed from the course specification** • **Learning indicators for each learning outcome**	**Learning Outcomes**		**Learning Indicators**		**Identify which cross-cutting issues - core and transferable skills, inclusivity, equity and addressing diversity. How will these be addressed or developed.**		
	CLO.3 Demonstrate knowledge and skills in the processes and proper use of tools, equipment and machines in the metal and automotive industries. (NTS pg. 10, NTECF pg. 29)		3.1 Use and operate tools, equipment and machines in the metal and automotive industries.		• Creativity • critical thinking • skills in the use of tools, equipment and machines in the metal and automotive industries.		

Topic Tools, Machine; and Metal Work Joining Processes	**Topic Sub-topic**	**Stage/Time**	**Teaching and learning activities to achieve learning outcomes: depending on delivery mode selected. Teacher led, collaborative group work or independent study**	
			Teacher Activity	**Student Activity**
	Previous Knowledge	Stage 1 - 10 min	**Introduction** Tutor facilitates student teachers revision of previous knowledge on Types and Uses of tools/ machines in the metal and automotive industries.	**Introduction** Student teachers answer question and do brief discussions.
	Classification of metal work joining processes (permanent and temporary) • Riveting, Soldering and Brazing processes and equipment	Stage 2 - 40 min	**Interactive Lecture** Tutor uses **Interactive lecture** to make brief presentation on the Classification of metal work joining processes (permanent and Temporary) OR **Video Presentation & Discussion** Tutor will use **pre- video recordings** from sources (YouTube, Khan Academy, Coursera, Udemy, MOOCs) to discuss Classification of metal work joining processes (permanent and Temporary)	**Interactive Lecture** Student teachers listen, contribute to discussions and write down important points. **Video Presentation, Discussion& Power Point Preparation** Student teachers engage in discussions and do power point presentation on Classification of metal work joining processes (Permanent and Temporary.)
		Stage 3 - 60 min	**Video Presentation, Discussion and Demonstration** Tutor will use **pre- video recordings** from sources (YouTube, Khan Academy, Coursera, Udemy, MOOCs) to discuss the equipment and demonstrate the processes ofRiveting.	**Video Presentation, Discussion and Demonstration** Student teachers discuss the equipment, demonstrate and present a project work onRiveting
		Stage 4 - 60 min	**Group Discussion & Demonstration** Tutor guides students in groups to discuss the equipment and demonstrate the processes ofSoldering and Brazing	**Video Presentation, Discussion and Demonstration** Student teachers engage in discussions on the equipment and demonstrate and present a project work onSoldering and Brazing
		Stage 5 - 10 min	**Closure** Tutor Reflects on the metal work joining processes (permanent and temporary)	**Closure** Students reflect on the metal work joining processes (permanent and temporary)

Lesson assessments – evaluation of learning: of, for and as learning within the lesson (linking to learning outcomes)	**Component 1 Assessment type: Assessment of Learning** **Category of Assessment**: quiz 1. Classification of metal work joining processes(permanent and temporary) **2.** Riveting, Soldering and Brazing processes **Learning Outcomes assessed: LO3** **Weighting (40%)** **Component 2** **Assessment Type: Assessment for and as Learning** **Component 2; Continuous Assessment 1** **Category of Assessment:** Student teachers assessed through observation and contributions to class discussion, **Oral Presentations such as Power-Point presentations, as well as project work** on the lesson: 1. Small Group Power Point presentation on Classification of metal work joining processes (Permanent and Temporary)CLO3 2. Small Group Project Work onRiveting 3. Small Group Project Work onSoldering and Brazing 4. Reflection by student teachers **Learning Outcomes assessed: LO3** **Weighting (60%)**
Teaching Learning Resources	1. Rivet equipment/set 2. Interactive boards 3. Internet facility 4. Soldering bits
Required Text (core)	Callister, W.D and Rethwisch, D.G (2013). Materials Science and Engineering: An Introduction 9th Edition. Wiley. Denton, T. (2014). Automobile electrical and electronic systems. Amsterdam: Butter-worth-Heinemann. Dolan, J.A. (1979). Motor vehicle technology and practical work (Parts 1 and 2). Hong Kong: Heinemann Educational Books Ltd. Sackey, J.K.N. &Amoakohene, S.K. (1996). Metalwork Technology. London, Macmillan Publications
Additional Reading List	Gill, P. S. (2011). A textbook of automobile engineering (vol. 1).New Delhi: S. K. Katari&Sons. Hillier, V.A.W. (1991). Fundamentals of motor vehicle technology (4th ed.). Musselburgh: Stanley Thornes Ltd. Jones, D. R.H and Ashby, M.F (2011). Engineering Materials 1, Fourth Edition: An Introduction to Properties, Applications and Design 4th Edition, Butterworth-Heinemann
CPD Needs	ls in Riveting, Brazing and Soldering.

LESSON 10

Year of B.Ed.	2	Semester	1	Place of lesson in semester	1 2 3 4 5 6 7 8 9 10 11 12

Title of Lesson	**Operation of Internal Combustion Engines**				**Lesson Duration**	**180 minutes**	
Lesson description	This lesson aim at exposing the student teacher to the requisite knowledge andunderstanding of the skills in the metal and automotive industries. The lesson will equip the Student teacher with the skills and principles in the Operation of Internal Combustion Engines						
Previous student teacher knowledge, prior learning (assumed)	Student-teachers are: • Familiar with Engines of Vehicles						
Possible barriers to learning in the lesson							
Lesson Delivery – chosen to support students in achieving the outcomes	**Face-to-face** ☑	**Practical Activity** ☑	**Work-Based Leaning**	**Seminars**	**Independent Study**	**e-learning opportunities** ☑	**Practicum**
Lesson Delivery – main mode of delivery chosen to support student teachers in achieving the learning outcomes.	Use **Interactive lecture** to make brief presentation on the Operation of Internal Combustion Engines Use **pre- video recordings** from sources (YouTube, Khan Academy, Coursera, Udemy, MOOCs)/ Simulation to discuss theOperation of Internal Combustion Engines						
• **Purpose for the lesson, what you want the students to achieve, serves as basis for the learning outcomes. An expanded version of the description.** • **Write in full aspects of the NTS addressed**	The purpose of this lesson is to introduce student teachers to the Operation of Internal Combustion Engines						
• **Learning Outcome for the lesson, picked and developed from the course specification** • **Learning indicators for each learning outcome**	**Learning Outcomes**		**Learning Indicators**		**Identify which cross-cutting issues - core and transferable skills, inclusivity, equity and addressing diversity. How will these be addressed or developed.**		
	CLO 4. Exhibit knowledge and understanding of the operation of Internal Combustion Engines.		4.1 Use simulations and pre- video recordings from Internet source to demonstrate and discuss to the operation of engines. 4.2 Discuss and produce a report comparing Compression and Spark Ignition Engines.		• critical thinking • skills in operation of Internal Combustion Engines		

Topic Operation of Internal Combustion Engines	**Topic** **Sub-topic**	**Stage/Time**	**Teaching and learning activities to achieve learning outcomes: depending on delivery mode selected. Teacher led, collaborative group work or independent study**	
			Teacher Activity	**Student Activity**
	Previous Knowledge	Stage 1 - 10 min	**Introduction** Tutor facilitates student teachers revision of previous knowledge on Engines of Vehicles	**Introduction** Student teachers answer question and do brief discussions.
	History of engines 2.Layout of an engine 3. Type of Internal Combustion engines	Stage 2 - 40 min	**Interactive Lecture & Discussion** Tutor uses **Interactive lecture** to make brief presentation on the History of engines OR **Video Presentation& Discussion** Tutor will use **pre- video recordings** from sources (YouTube, Khan Academy, Coursera, Udemy, MOOCs) to discuss History of engines	**Interactive Lecture & Discussion** Student teachers listen, contribute to discussions and write down important points. **Video Presentation& Discussion** Student teachers engage in discussions and do power point presentation onHistory of Engines.
		Stage 3 - 60 min	**Video Presentation & Discussion** Tutor will use **pre- video recordings** from sources (YouTube, Khan Academy, Coursera, Udemy, MOOCs) to discuss Layout of an engine.	**Video Presentation, Discussion&Portfolio Presentation** Student teachers prepare and present a Portfolio on the Layout of an engine.
		Stage 4 - 60 min	**Group Discussion** Tutor guide students in groups to discuss Type of Internal Combustion engines	**Group Discussion** Student teachers engage in discussions and do PowerPoint presentation on characteristics, merits and demerits of the Types of Internal Combustion Engines
		Stage 5 - 10 min	**Closure** Tutor Reflects on the characteristics, merits and demerits of the Types of Internal Combustion Engines and close lesson.	**Closure** Students reflect on the characteristics, merits and demerits of the Types of Internal Combustion Engines to end lesson.

Lesson assessments – evaluation of learning: of, for and as learning within the lesson (linking to learning outcomes)	**Component 1 Assessment type: Assessment of Learning** **Category of Assessment**: quiz 1. History of engines 2. Layout of an engine 3. characteristics, merits and demerits of the Type of Operation of Internal Combustion Engines **Learning Outcomes assessed: LO4** **Weighting (40%)** **Component 2** **Assessment Type: Assessment for and as Learning** **Component 2; Continuous Assessment 1** **Category of Assessment:** Student teachers assessed through observation and contributions to class discussion, **Oral Presentations such as Power-Point presentations, as well as portfolio** on the lesson: 1. History of engines 2. Layout of an engine 3. characteristics, merits and demerits of the Type of Operation of Internal Combustion Engines CLO4 4. Reflection by student teachers **Learning Outcomes assessed: LO4** **Weighting (60%)**
Teaching Learning Resources	4. Interactive boards 5. Internet facility 6. Type of Combustion Engines
Required Text (core)	Callister, W.D and Rethwisch, D.G (2013). Materials Science and Engineering: An Introduction 9th Edition. Wiley. Denton, T. (2014). Automobile electrical and electronic systems. Amsterdam: Butter-worth-Heinemann. Dolan, J.A. (1979). Motor vehicle technology and practical work (Parts 1 and 2). Hong Kong: Heinemann Educational Books Ltd. Sackey, J.K.N. &Amoakohene, S.K. (1996). Metalwork Technology. London, Macmillan Publications
Additional Reading List	Gill, P. S. (2011). A textbook of automobile engineering (vol. 1).New Delhi: S. K. Katari&Sons. Hillier, V.A.W. (1991). Fundamentals of motor vehicle technology (4th ed.). Musselburgh: Stanley Thornes Ltd. Jones, D. R.H and Ashby, M.F (2011). Engineering Materials 1, Fourth Edition: An Introduction to Properties, Applications and Design 4th Edition, Butterworth-Heinemann
CPD Needs	Documentary Analysis and discussion on characteristics, merits and demerits of Internal mbustion Engines

LESSON 11

Year of B.Ed.	2	Semester	1	Place of lesson in semester	1 2 3 4 5 6 7 8 9 10 11 12

Title of Lesson	Operation of Internal Combustion Engines				**Lesson Duration**	**180 minutes**	
Lesson description	This lesson aim at exposing the student teacher to the requisite knowledge and understanding of the skills in the metal and automotive industries. The lesson will equip the Student teacher with the characteristics of Internal Combustion Engines. This lesson will alsoexpose the student teacher tothe differences betweenSpark Ignition Engines and Compression (Diesel) Engines.						
Previous student teacher knowledge, prior learning (assumed)	Student-teachers are: 1. Familiar with characteristics, merits and demerits of the Type of Operation of Internal Combustion Engines						
Possible barriers to learning in the lesson							
Lesson Delivery – chosen to support students in achieving the outcomes	**Face-to-face** ☑	**Practical Activity** ☑	**Work-Based Leaning**	**Seminars**	**Independent Study**	**e-learning opportunities** ☑	**Practicum**
Lesson Delivery – main mode of delivery chosen to support student teachers in achieving the learning outcomes.	Use **Interactive lecture** to make brief presentation on the differences betweenSpark Ignition Engines and Compression (Diesel) Engines. Use **pre- video recordings/ simulation** from sources (YouTube, Khan Academy, Coursera, Udemy, MOOCs) to discuss, prepare and present a Portfolio on the characteristics the Spark Ignition Engines and Compression (Diesel) Engines						
• **Purpose for the lesson, what you want the students to achieve, serves as basis for the learning outcomes. An expanded version of the description.** • **Write in full aspects of the NTS addressed**	The purpose of this lesson is to introduce student teachers to the characteristics and differences betweenSpark Ignition Engines and Compression (Diesel) Engines						
• **Learning Outcome for the lesson, picked and developed from the course specification** • **Learning indicators for each learning outcome**	**Learning Outcomes**		**Learning Indicators**		**Identify which cross-cutting issues - core and transferable skills, inclusivity, equity and addressing diversity. How will these be addressed or developed.**		
	CLO 4. Exhibit knowledge and understanding of the operation of Internal Combustion engines.		4.2 Discuss and produce a report comparing compression and spark ignition engines		1.critical thinking 2.skills in differentiating between Spark Ignition and Compression Engines		

Topic Operation of Internal Combustion Engines	**Topic** **Sub-topic**	**Stage/Time**	**Teaching and learning activities to achieve learning outcomes: depending on delivery mode selected. Teacher led, collaborative group work or independent study**	
			Teacher Activity	**Student Activity**
	Previous Knowledge	Stage 1 - 10 min	**Introduction** Tutor facilitates student teachers revision of previous knowledge on characteristics, merits and demerits of the Type of Operation of Internal Combustion Engines	**Introduction** Student teachers answer question and do brief discussions.
	Spark Ignition Engines Compression (Diesel) Engines	Stage 2 - 60 min	**Video Presentation& Discussion** Tutor will use **pre- video recordings/ simulation** from sources (YouTube, Khan Academy, Coursera, Udemy, MOOCs) to discuss characteristics ofSpark Ignition Engines	**Video Presentation & Discussion** Student teachers engage in discussions and do power point presentation on characteristics ofSpark Ignition Engines
		Stage 3 - 60 min	**Video Presentation& Discussion** Tutor will use **pre- video recordings** from sources (YouTube, Khan Academy, Coursera, Udemy, MOOCs) to discuss the characteristics of Compression (Diesel) Engines	**Video Presentation, Discussion& Portfolio Presentation** Student teachers prepare and present a Portfolio on the characteristics of Compression (Diesel) Engines.
		Stage 4 - 40 min	**Group Discussion** Tutor guide students in groups to discuss the differences betweenSpark Ignition Engines and Compression (Diesel) Engines	**Group Discussion** Student teachers engage in discussions and do PowerPoint presentation on differences betweenSpark Ignition Engines and Compression (Diesel) Engines
		Stage 5 - 10 min	**Closure** Tutor reflects on the characteristics/differences betweenSpark Ignition Engines and Compression (Diesel) Engines and close the lesson	**Closure** Students reflect on the characteristics/differences betweenSpark Ignition Engines and Compression (Diesel) Engines
Lesson assessments – evaluation of learning: of, for and as learning within the lesson (linking to learning outcomes)	**Component 1 Assessment type: Assessment of Learning** **Category of Assessment**: quiz 1. characteristics of Compression (Diesel) Engines 2. characteristics of Spark Ignition Engines **Learning Outcomes assessed: LO4** **Weighting (40%)** **Component 2** **Assessment Type: Assessment for and as Learning** **Component 2; Continuous Assessment 1**			

	Category of Assessment: Student teachers assessed through observation and contributions to class discussion, Oral Presentations such as Power-Point presentations, as well as portfolio on the lesson: 1. Group presentation of Portfolio on the characteristics of Compression (Diesel) Engines.CLO4 2. Small Group PowerPoint presentation on characteristics of Spark Ignition EnginesCLO4 3. Reflection by student teachers **Learning Outcomes assessed: LO4** **Weighting (60%)**
Teaching Learning Resources	1. Spark Ignition Engines and Compression (Diesel) Engines 2. Interactive boards 3. Internet facility
Required Text (core)	Callister, W.D and Rethwisch, D.G (2013). Materials Science and Engineering: An Introduction 9th Edition. Wiley. Denton, T. (2014). Automobile electrical and electronic systems. Amsterdam: Butter-worth-Heinemann. Dolan, J.A. (1979). Motor vehicle technology and practical work (Parts 1 and 2). Hong Kong: Heinemann Educational Books Ltd. Sackey, J.K.N. &Amoakohene, S.K. (1996). Metalwork Technology. London, Macmillan Publications
Additional Reading List	Gill, P. S. (2011). A textbook of automobile engineering (vol. 1).New Delhi: S. K. Katari&Sons. Hillier, V.A.W. (1991). Fundamentals of motor vehicle technology (4th ed.). Musselburgh: Stanley Thornes Ltd. Jones, D. R.H and Ashby, M.F (2011). Engineering Materials 1, Fourth Edition: An Introduction to Properties, Applications and Design 4th Edition, Butterworth-Heinemann
CPD Needs	1. Documentary Analysis and discussion on characteristics ofSpark Ignition Engines and Compression (Diesel) Engines 2. Manipulating of Interactive Board 3. Skills in operating Spark Ignition Engines and Compression (Diesel) Engines

LESSON 12

Year of B.Ed.	2	Semester	1	Place of lesson in semester	1 2 3 4 5 6 7 8 9 10 11 12

Title of Lesson	Operation of Internal Combustion Engines			**Lesson Duration**	**180 minutes**		
Lesson description	This lesson aims to equip the Student teacher with the principles in the Operation of Internal Combustion Engines that is Spark Ignition Engines and Compression (Diesel) Engines.						
Previous student teacher knowledge, prior learning (assumed)	Student-teachers are: Familiar with the differences between theSpark Ignition Engines and Compression (Diesel) Engines.						
Possible barriers to learning in the lesson							
Lesson Delivery – chosen to support students in achieving the outcomes	**Face-to-face ☑**	**Practical Activity ☑**	**Work-Based Leaning**	**Seminars**	**Independent Study**	**e-learning opportunities ☑**	**Practicum**
Lesson Delivery – main mode of delivery chosen to support student teachers in achieving the learning outcomes.	Use **Interactive lecture** to make brief presentation on the Principles of Operation of internalcombustion engines Use **pre- video recordings** from sources (YouTube, Khan Academy, Coursera, Udemy, MOOCs) to discuss, prepare and present a Portfolio on the Principles of Operation of internal combustion engines						
• **Purpose for the lesson, what you want the students to achieve, serves as basis for the learning outcomes. An expanded version of the description.** • **Write in full aspects of the NTS addressed**	The purpose of this lesson is to introduce student teachers to the Principles of Operation of Internal Combustion Engines						
• **Learning Outcome for the lesson, picked and developed from the course specification** • **Learning indicators for each learning outcome**	**Learning Outcomes**	**Learning Indicators**	**Identify which cross-cutting issues - core and transferable skills, inclusivity, equity and addressing diversity. How will these be addressed or developed.**				
	CLO 4. Exhibit knowledge and understanding of the operation of Internal Combustion Engines	4.1 Use simulations and pre-video recordings from Internet source to demonstrate and discuss theoperation of engines.	1.critical thinking 2.skills in Principles of Operation of internal combustion engines, Spark Ignition and Compression Engines				

Topic	Topic Sub-topic	Stage/ Time	Teaching and learning activities to achieve learning outcomes: depending on delivery mode selected. Teacher led, collaborative group work or independent study	
			Teacher Activity	**Student Activity**
Operation of Internal Combustion Engines Spark Ignition Engines and Compression (Diesel) Engines.	Previous Knowledge	Stage 1 - 10 min	**Introduction** Tutor facilitates student teachers revision of previous knowledge on the differences between the Spark Ignition Engines and Compression (Diesel) Engines.	**Introduction** Student teachers answer question and do brief discussions.
	Principles of operating Internal Combustion Engines	Stage 2 - 60 min	**Interactive Lecture & Discussion** Tutor uses **Interactive lecture** to make brief presentation on the Principles of Operating Spark Ignition Engines OR **Video Presentation & Discussion** Tutor will use **pre- video recordings/ simulation** from sources (YouTube, Khan Academy, Coursera, Udemy, MOOCs) to discuss Principles of Operating Spark Ignition Engines.	**Interactive Lecture & Discussion** Student teachers listen, contribute to discussions and write down important points. **Video Presentation, Discussion& Power Point Presentation** Student teachers engage in discussions and do power point presentation on Principles of operating Spark Ignition Engines.
		Stage 3 - 60 min	**Video Presentation & Discussion** Tutor will use **pre- video recordings** from sources (YouTube, Khan Academy, Coursera, Udemy, MOOCs) to discuss Principles of Operating Compression (Diesel) Engines.	**Video Presentation, Discussion& Power Point Presentation** Student teachers prepare and present a Portfolio on the Principles of Operating Compression (Diesel) Engines
		Stage 4 - 40 min	**Demonstration** Tutor Use guided demonstration to illustrate the principles and operation of Spark Ignition and Compression (Diesel) Engines.	**Demonstration** Student teachers engage indemonstration to illustrate the principles and operation of engines
		Stage 5 - 10 min	**Closure** Tutor Reflects on the Principles of operating Spark Ignition Engines and Compression (Diesel) Enginesto close.	**Closure** Students reflect on the Principles of operating Spark Ignition Engines and Compression (Diesel) Engines.

Lesson assessments – evaluation of learning: of, for and as learning within the lesson (linking to learning outcomes)	**Component 1 Assessment type: Assessment of Learning** **Category of Assessment**: quiz 1. Principles of Operating Spark Ignition Engines **2.** Principles of Operating Compression (Diesel) Engines **Learning Outcomes assessed: LO4** **Weighting (40%)** **Component 2** **Assessment Type: Assessment for and as Learning** **Component 2; Continuous Assessment 1** **Category of Assessment:** Student teachers assessed through observation and contributions to class discussion, **Oral Presentations such as Power-Point presentations, as well as portfolio** on the lesson: 1. Small Group PowerPoint presentation on Principles of Operating Spark Ignition EnginesCLO4 2. Group presentation of Portfolio on Principles of Operating Compression (Diesel) Engines 3. Reflection by student teachers **Learning Outcomes assessed: LO4** **Weighting (60%)**
Teaching Learning Resources	1. Spark Ignition Engines and Compression (Diesel) Engines 2. Interactive boards 3. Internet facility
Required Text (core)	Callister, W.D and Rethwisch, D.G (2013). Materials Science and Engineering: An Introduction 9th Edition. Wiley. Denton, T. (2014). Automobile electrical and electronic systems. Amsterdam: Butter-worth-Heinemann. Dolan, J.A. (1979). Motor vehicle technology and practical work (Parts 1 and 2). Hong Kong: Heinemann Educational Books Ltd. Sackey, J.K.N. &Amoakohene, S.K. (1996). Metalwork Technology. London, Macmillan Publications
Additional Reading List	Gill, P. S. (2011). A textbook of automobile engineering (vol. 1).New Delhi: S. K. Katari&Sons. Hillier, V.A.W. (1991). Fundamentals of motor vehicle technology (4th ed.). Musselburgh: Stanley Thornes Ltd. Jones, D. R.H and Ashby, M.F (2011). Engineering Materials 1, Fourth Edition: An Introduction to Properties, Applications and Design 4th Edition, Butterworth-Heinemann
CPD Needs	Principles in operating Spark Ignition Engines and Compression (Diesel) Engines
Course Assessment	**Component 1:Subject** Portfolio Assessment (overall score = **30%)** **Selected items of students work (3 of them=10% each)** • **Written Assignment** • **Group Presentation** • **Individual Presentation** • **Midterm assessment/Quiz……..=20%** • **Reflective Journal …….. =40%** • **Organisation of the Portfolio …….= 10% (how it is presented/ organized)** Weighting :30% Assesses Learning Outcomes ; CLO 1,2,3,4,5 and 6

	Component 2 : Subject Project**(30% overall assessment)** **Task student teachers to design a survey instrument to collect data on their peers perception of various ATR beliefs. Should be analysed and the outcome used to create a poster to be presented during the 11th lesson.** • Introduction; clear statement of aim and purpose…….= 10% • Methodology : what the student has done and why…….= 20% • Substantive or main sections ……..= 40% • Conclusion…… = 30% Assesses Learning Outcomes ; CLO 2,3,4 and 6 **Component 3:** End of Semester Examination…… =**40%** Assesses Learning Outcomes ; CLO 1,2,3,4,5 and 6

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