**REPUBLIC OF RWANDA**

**MINEDUC**

**GASABO DISTRICT**

**SCHEME OF WORK FOR SENIOR SIX**

**Academic year: 2022-2023 Term I School:** ……………………….. …. **Subject: MATHEMATICS**

**Teacher’s name**: ………….................................................**combination:** ..... **Number of period per week: 7periods**

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| **DATES AND NUMBER OF PERIODS IN WEEKS** | | **UNITS + KEY UNITS COMPETENCES** | **LESSONS+EVALUATIONS** | **LEARNING OBJECTIVES** | **TEACHING METHODS AND TECHNIQUES+EVALUATION PROCEDURES** | **RESOURCES AND REFERENCES** | **OBSERVATIONS** |
| 1 | 26-30/1/2022 | **Unit 1: COMPLEX NUMBERS**  Key unit  competence  Perform operations on complex numbers in different forms and use complex numbers to solve related problems in Physics (voltage and current in alternating current), computer Science (fractals), Trigonometry (Euler’s formula to transform trigonometric expressions | Concepts of complex numbers:  •Definition and structures  •Algebraic structures ϖ  Algebraic form of Complex numbers  •Definition and properties of “ i ”  •Operations:  -Addition, subtraction,  multiplication, powers,  Conjugate and division  •Modulus of a complex number  Square roots in the set of complex  numbers  •Equations in the set  of complex numbers  -Polynomials in the set of complex numbers  ***-***Geometric representation of complex numbers  -Polar form of complex numbers  •Definition  •Modulus and argument of a complex number  •Operations  •De Moivre’s formula  ***-***Nth roots of a complex number  •Construction of regular polygons  Exponential forms of complex numbers:  -Definition and operations  -Euler’s formula of complex Numbers.  Application of complex numbers  •Product to sum formulas in  trigonometry  •Solution of linear trigonometric  equations  •Alternating current problems in Physics  **SUMMATIVE EVALUATION** | - Apply the properties of complex numbers to perform operations on complex numbers in algebraic form, in polar form or in exponential form.  - find the modulus and square roots of a complex number.  - Solve in the set of complex numbers a linear or quadratic equation.  - Use the properties of complex number on Argand diagram.  - State De Moivre’s formula and Euler’s formula. | -Group Discussion  - questioning  - Team work  -Research | -Advanced mathematics for Rwandan schools senior six  .REB,(2015),mathematics syllabus for advanced level, Kigali-Rwanda  -Internet  Shampiyona,2005. Mathematique 6 |  |
| 2 | 03-07/10/2022 | -Group Discussion  - questioning  - Team work  -Research | -Advanced mathematics for Rwandan schools senior six |  |
| 3 | 10-14/10/2022 | -Group Discussion  - questioning  - Team work  -Research | -Advanced mathematics for Rwandan schools senior six |  |
| 4 | 17-21/10/2022 | -Group Discussion  - questioning  - Team work  -Research | -Advanced mathematics for Rwandan schools senior six |  |
| 5 | 24-28/10/2022 | **Unit 2:**  **LOGARITHMIC AND EXPONENTIAL**  **FUNCTIONS.**  **Key unit**  **competence** Extend the concepts of functions to investigate fully logarithmic and exponential functions, finding the domain of  definition, the limits, asymptotes, variations, graphs, and model problems about interest rates, population growth or decay, magnitude of  earthquake, etc | **Lesson title and evaluation** Logarithmic functions  Domain of definition  Limits of logarithmic  functions and their  applications to  continuity and  asymptotes  Differentiation and its applications  Curve sketching  Exponential functions  Domain of definition  Limits of logarithmic  functions and their  applications to  continuity and  asymptotes  •Differentiation and its applications  •Curve sketching  Applications of logarithmic  and exponential functions:  -Interest rates problems  -Mortgage problems  -Population growth  problems  -Radioactive decay  problems  -Earthquake problems  -Carbon dating problems  -Problems about alcohol and  risk of car accident  ***SUMMATIVE EVALUATION*** | - transform a logarithm from a base to another.  - Find the domain and the range of logarithmic or exponential functions.  - calculate limits of logarithmic and exponential functions.  - Determine possible asymptotes of a logarithmic or an exponential function.  - Solve related problems involving logarithms.  - Sketch the graph of a logarithmic or an exponential | -Group Discussion  - questioning  - Team work  -Research | -Advanced mathematics for Rwandan schools senior six |  |
| 6 | 31/10-04/11/2022 | -Group Discussion  - questioning  - Team work  -Research | -Advanced mathematics for Rwandan schools senior six |  |
| 7 | 07-11/11/2022 | -Group Discussion  - questioning  - Team work  -Research | -Advanced mathematics for Rwandan schools senior six |  |
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| 8 | 14-18/11/2022 |
| 9 | 21-25/11/2022 | **Unit 3:**  **TAYLOR and MAC**  **-**  **LAURIN’S EXPANSIONS**  **: Key unit**  **Competence:** Use Taylor and Maclaurin’s expansion to solve problems about approximations, limits, integration,...Extend the Maclaurin’s expansion to Taylor Serie. | -Generalities on series  •Definition  •Convergence of  series  •Power series:  •Definition and  properties  -Taylor series and  Maclaurin series  -Applications:  •Approximation of an irrational number  by a rational  number | - Derive the Maclaurin’s series for and | -Group Discussion  - questioning  - Team work  -Research | -Advanced mathematics for Rwandan schools senior six  .REB,(2015),mathematics syllabus for advanced level, Kigali-Rwanda  -Internet  Shampiyona,2005. Mathematique 6 |  |
| 10 | 28/11-02/12/2022 | •Approximation of  the roots of  equations  •Calculation of limits  •Evaluating definite  integrals, etc | - Use Maclaurin’s series to approximate an irrational number or the roots of a transcendental equation.  - Calculate a definite integral using Maclaurin’s expansion to perform operations on Maclaurin’s series (addition, multiplication by a scalar; multiplication and division of functions). | -Group Discussion  - questioning  - Team work  -Research |  |  |
| 11 | 05-09/12/2022 | **REVIEW AND SUMMATIVE EVALUATION** | | | | | |
| 12 | 12-16/12/2022 | **EXAMINATION PERIOD** | | | | | |
| 12 | 19-23/12/2022 | **MARKING AND REPORTS SUBMISSION** | | | | | |

**SCHEME OF WORK FOR SENIOR SIX**

**Academic year: 2022-2023 Term II School:** ……………………….. …. **Subject: MATHEMATICS**

**Teacher’s name**: …………...........................................**Class+ combination:** ............. **Number of period per week: 7periods**

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| **DATES AND NUMBER OF PERIODS IN WEEKS** | | **UNITS + KEY UNITS COMPETENCES** | **LESSONS+EVALUATIONS** | **LEARNING OBJECTIVES** | **TEACHING METHODS AND TECHNIQUES+EVALUATION PROCEDURES** | **RESOURCES AND REFERENCES** | **OBSERVATIONS** |
| 1 | 09-13/01/2023 | **Unit 4:**  **INTEGRATION**  **Key unit**  **Competenc**e:  Use integration as the inverse of differentiation and as the limit of a sum then apply it to find area of plane surfaces, volumes  of solid of revolution, lengths of curved lines | **Lesson title and evaluation:**  -**Differentials:**   * Definitions and operations on increments * Properties of differentials * Applications:   **\***Approximation  \*Calculation of error | - Use differentials equations to approximate a function and to calculate the percentage error in estimation.  - Calculate integrals. Using appropriate techniques.  - Use properties of integrals to simplify the calculation of integrals.  - Calculate a limit of a sum to infinity as definite integrals. | -Group Discussion  - questioning  - Team work  -Research | -Advanced mathematics for Rwandan schools senior six  .  REB,(2015),mathematics syllabus for advanced level, Kigali-Rwanda  -Internet  -Shampiyona,2005. Mathematique 6 |  |
| 2 | 16-20/01/2023 |  | Stewart, J. (2008). Calculus(6th edition) |  |
| 3 | 23-27/01/2023 |  | **-Indefinite integrals:**   * Anti-derivatives * Definition and properties * Technics of integration:   \*Basic integration formulas |  | -Group Discussion  - questioning  - Team work  -Research | Stewart, J. (2008). Calculus(6th edition) |  |
| 4 | 30/01-03/02/2023 |  | \*Integration by change of variables  \*Integration by parts |  | -Group Discussion  - questioning  - Team work  -Research | -Advanced mathematics for Rwandan schools senior six  .  REB,(2015),mathematics syllabus for advanced level, Kigali-Rwanda  -Internet  -Shampiyona,2005. Mathematique 6 |  |
| 5 | 06-10/02/2023 |  | \*Integration of rational functions by partial fractions  \*Integration of trigonometric functions  **-FORMATIVE EVALUATION** |  | -Group Discussion  - questioning  - Team work  -Research | Stewart, J. (2008). Calculus(6th edition) |  |
| 6 | 13-17/02/2023 |  | **-Definite integrals:**   * Definition * Properties * Technics of integration * Applications of definite integrals:   **\***Calculation of area of a plane surface | - Apply definite integrals to calculate the area, volume,and Arc of length. | -Group Discussion  - questioning  - Team work  -Research | Stewart, J. (2008). Calculus(6th edition) |  |
| 7 | 20-24/02/2023 |  | \*Calculation of volume of a solid of revolution  \*Calculation of length of curved lines  \*Application in physics (work, energy).  **-SUMMATIVE EVALUATION** |  | -Group Discussion  - questioning  - Team work  -Research | -Advanced mathematics for Rwandan schools senior six  . |  |
| 8 | 27/02-03/03/2023 | **UNIT 5: DIFFERENTIAL EQUATIONS**  **Key unit competence:**  Use ordinary differential equations of 1st and 2nd order to modal and solve related problems in physics, economics, chemistry and biology. | **Lesson title and evaluation:**  **-Definition and classification**  **-**1st order differential equations   * Differential equations with separable variables * Simple homogeneous differential equations * Linear differential equations | -Extend the concept of differentiation and integration to ordinary differential equations  - state the order and the degree of an ordinary differential equations | -Group Discussion  - questioning  - Team work  -Research | Bronson, R. (2003). Shaum’s Outline, differential equations. |  |
| 9 | 06-10/03/2023 |  | **-2ndorder differential equations:**   * **Linear equations with constant coefficients:**   **\***The right hand side is equal to zero  \*The right hand side is a polynomial function  \*The right hand side is a trigonometric function  \*The right hand side is an exponential function | -Express the auxiliary quadratic equation of an homogeneous linear differential equation of the 2nd order with constant coefficients  -predict the form of particular solution of an ordinary linear differential equation of 2nd order. | -Group Discussion  - questioning  - Team work  -Research | Bronson, R. (2003). Shaum’s Outline, differential equations.  -Advanced mathematics for Rwandan schools senior six |  |
| 10 | 13-17/03/2023 | **REVIEW AND SUMMATIVE EVALUATION** | | | | | |
| 11 | 20-24/03/2023 | **EXAMINATIONS PERIOD** | | | | | |
| 12 | 27-31/03/2023 | **MARKING AND REPORT SUBMISSION** | | | | | |

**SCHEME OF WORK FOR SENIOR SIX**

**Academic year: 2022-2023 Term III School:** ……………………….. …. **Subject: MATHEMATICS**

**Teacher’s name**: ………….................................................**Class+ combination:** ............**Number of period per week: 7periods**

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| **DATES AND NUMBER OF PERIODS IN WEEKS** | | **UNITS + KEY UNITS COMPETENCES** | **LESSONS+EVALUATIONS** | **LEARNING OBJECTIVES** | **TEACHING METHODS AND TECHNIQUES+EVALUATION PROCEDURES** | **RESOURCES AND REFERENCES** | **OBSERVATION** |
| 1 | 17-21/04/2023 | **Unit 6: INTERSECTION AND SUM OF SUBSPACES Key unit**  **Competence** Relate the sum and the intersection of subspaces of a vector space by the dimension formula | **Lesson title and evaluation:** Intersection of subspaces  Definition  Dimension of  the intersection of subspaces  Sum of subspaces  Definition  Dimension of  the sum of subspaces  Dimension formula  Direct sum of subspaces  ***-SUMMATIVE EVALUATION*** | -Perform the intersection and addition of subspaces of a vector space.  - Determine a basis of the intersection and a basis of the sum of the subspaces of a vector space.  -Apply the concepts of dimension formula to determine whether a vector space is direct sum or not of its given subspaces. | -Group Discussion  - questioning  - Team work  -Research | -Advanced mathematics for Rwandan schools senior six  .  REB,(2015),mathematics syllabus for advanced level, Kigali-Rwanda  -Internet    Shampiyona,2005. Mathematique 6 |  |
| 2 | 24-28/04/2023 | **Unit 7: TRANSFORMATION OF MATRICES**  **Key unit**  **Competence**: Transform matrices to an echelon form or to diagonal matrix and use the results to solve simultaneous  linear equations or to calculate the nth power of a matrix | **1.Kernel and range**  •Definitions:  Nullity and rank of a linear mapping  •Dimension formula for linear Mapping, **2.Elementary row operations**  •Elementary row operations  •Row reducing matrices to echelon  form | - Use definitions and properties to determine the Kernel and the image of linear transformation.  - Apply the concept and linear transformation.  -Use elementary row operations to obtain a matrix in echelon form and to solve simultaneous linear equations. | -Group  Discussion  - Questioning  - Team work  -Research | -Advanced mathematics for Rwandan schools senior six  .  REB,(2015),mathematics syllabus for advanced level, Kigali-Rwanda  -Internet |  |
| 3 | 01-05/05/2023 |  | **3.Diagonalisation** **4.Applications**  ***-SUMMATIVE EVALUATION*** |  |  |  |  |
| 4 | 08-12/05/2023 | **UNIT 8: CONICS.**  **KEY UNIT**  **COMPETENCE:** Determine the characteristics and the graph of a conic given by its Cartesian, parametric or polar equation •Find the Cartesian, parametric and polar equations of a conic from its characteristics. | Parabola :  •Definition  •Cartesian and parametric  equations  •Graphical representation of a  parabola  •Characteristics of a parabola  (Vertex, axis of symmetry, focus,  directrix, tangent and normal, ...)  •General equation  Ellipse:  •Definition  •Cartesian and parametric equations  •Graphical representation of an  ellipse  •Characteristics of an ellipse (Centre of symmetry, Vertices,  axes of symmetry,  Eccentricity, foci, directrices, tangent and normal, ...)  •General equation  Hyperbola:  •Definition  •Cartesian and parametric equation  •Graphical representation of a  hyperbola  •Characteristics of a hyperbola (Centre of symmetry, Vertices,  axes of symmetry, asymptotes,Eccentricity, foci, directrices,  tangent and normal,  ***-FORMATIVE EVALUATION*** | -Find the  characteristics of a conic given its équations (centre, axes, vertices, tangent,  normal, shapes, asymptotes, foci, directrices, eccentricity , etc.)  -Determine the Cartesian, parametric and polar equations of a conic from its characteristics Derive the standard  equation of a conic, in standard form.  - Use diagonalization of matrices to simplify the equation of an ellipse or a hyperbola  - Derive the standard equation of a conics, in standard form. | -Group Discussion  - questioning  - Team work  -Research | . -Advanced mathematics for Rwandan schools senior six  .  REB,(2015),mathematics syllabus for advanced level, Kigali-Rwanda  -Internet  -Shampiyona, 2005. Mathematique 6 |  |
| 5 | 15-19/05/2023 | -Group Discussion  - questioning  - Team work  -Research | . -Advanced mathematics for Rwandan schools senior six  .  REB,(2015),mathematics syllabus for advanced level, Kigali-Rwanda  -Internet    Shampiyona,2005. Mathematique 6 |  |
| 6 | 22-26/05/2023 | -Group Discussion  - questioning  - Team work  -Research | -Advanced mathematics for Rwandan schools senior six  .  REB,(2015),mathematics syllabus for advanced level, Kigali-Rwanda  -Internet |  |
| 7 | 29/05-02/06/2023 | **Unit 9: RANDOM VARIABLES.**  **Key unit**  **Competence**: Calculate and interpret the parameters of a random variable (discrete or continuous) including  binomial and the Poisson distributions. | •General equation  Polar coordinates:  •Definition  •Conversion of polar coordinates to Cartesian coordinates and vice versa  •Straight line, circle and conics in  polar coordinates  **-SUMMATIVE EVALUATION**  Discrete and finite random  variable:  •Probability distribution  •Expected value, variance and  standard deviation of a discrete random variable  •Cumulative distribution  function  •Binomial and  •The Poisson distribution  Continuous random variables  •Probability density function  •Expected value, variance and  standard deviation of a discrete random variable  ***-ANNUAL EVALUATION*** | - Use the concepts of statistics to compare frequency distribution to probability distribution.  - calculate and interpret the parameters of a random variable.  - construct the probability distribution of discrete random variable.  - Determine whether a function can serve as probability density functions or not.  - Apply binomial and the Poisson distributions to solve related problems. | -Group Discussion  - questioning  - Team work  -Research | . -Advanced mathematics for Rwandan schools senior six  .  REB,(2015),mathematics syllabus for advanced level, Kigali-Rwanda  -Internet |  |
| 8 | 05-09/06/2023 | -Group Discussion  - questioning  - Team work  -Research | Feller, W [1968]. An introduction to probability theory and its application, third edition, Wiley, New York. |  |
| 9 | 12-16/06/2023 | -Group Discussion  - questioning  - Team work  -Group Discussion  - questioning  - Team work  -Research | Feller, W [1968]. An introduction to probability theory and its application, third edition, Wiley, New York. |  |
| 10 | 19-23/06/2023 | -Group Discussion  - questioning  - Team work  -Research | Feller, W [1968]. An introduction to probability theory and its application, third edition, Wiley, New York.  Shampiyona,2005. Mathematique 6  . Feller, W [1968]. An introduction to probability theory and its application, third edition, Wiley, New York. |  |
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| 11 | 26-30/06/2023 | **REVIEW AMD SUMMATIVE EVALUATION** | | | | | |
| 12 | 03-07/07/2023 | **EXAMINATION PERIOD** | | | | | |
| 13 | 10-14/07/2023 | **MARKING AND REPORTS SUBMISSION** | | | | | |

***END OF ACADEMIC YEAR 2022/2023***