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| Course Title | **Mathematics II** |
| Course Code | MANS-103 |
| Course Type | Required |
| Level | 1st Cycle |
| Year / Semester | 1st Year, Spring Semester  |
| Teacher’s Name |  |
| ECTS | 3 | Theory | Laboratory | Simulation | Tutorial | Seminar |
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| Course Purpose and Objectives | The main objectives of the course are to:* Present data using basic statistics
* To perform trigonometric functions and operations;
* To understand and apply basic geometry
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| Learning Outcomes | After completion of the course students are expected to be able to: * Extract information with the use of statistics
* Be proficient in calculations involving the basic arithmetical operations and algebra essentials;
* Deal with arithmetical expressions involving the use of brackets;
* Construct graphs of linear and polynomial expressions
* Solve problems in algebra.
* Perform basic interpolation of functions
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| Prerequisites | MANS-101 | Required | None |
| Course Content | 1. **TRIGONOMETRY**
* Describes the measurement of angle in degrees, minutes and seconds of arc
* Describes the measurement of angle in circular measure and defines the radian
* States that 1 radian is approximately equivalent to 57.3o
* Defines sine, cosine and tangent as ratios of the sides of a right-angled triangle
* Defines the reciprocal ratios cosecant, secant and cotangent
* States the complementary pairs of ratios
* Solves problems reducible to right-angled triangles
* States the values of trigonometrical functions for angles 0o, 30o,45 o, 60o, 90o (using scientific calculators)
* Determines the trigonometrical functions for angles of any size
* Draws graphs of the trigonometrical functions over the range -360o to 360o
* States the period of the functions sine, cosine and tangent
* Uses trigonometrical formula sin2a + cos2a = 1 and sina/cosa = tana in solving simple identities
* Solves problems involving the application of objectives on right angled triangle /oblique plane triangles using the cosine and sine formulae
* Explains the ambiguous case when using the sine formula
1. **MENSURATION**
* Revises calculations for the perimeters and areas of:

 - a square  - a rectangle  - a parallelogram  - a trapezium  - a rhombus  - a triangle  - a circle * Calculates the areas of sectors and segments of a circle
* Calculates the surface areas and volumes of:

 - a cube  - a rectangular and a triangular prism  - a cylinder  - a right circular cone  - a sphere * Length and Angle;
* Use of instruments to construct simple figures;
* Calculate the perimeter, area and volume of rectangular figures;
* Angles of triangle and angles formed by the intersection of lines;

basic algebra and solution of linear and quadratics equations1. **GEOMETRY**
* Distinguishes equilateral, isosceles, right-angled and scalene triangles
* Defines acute, obtuse and reflex angles
* States the sum of the angles of a plane triangle
* Proves the property of exterior angles
* Explains what is meant by congruent triangles
* Solves problems involving the application of objectives
* Describes the properties of similar triangles
* Constructs triangles from given data
* Explains the ambiguous case, given two sides and a non-included angle
* States Pythagoras's theorem, without proof, and uses it to calculate one side of a right-angled triangle, given the other two
* States the relationships between angles formed by a transversal to two parallel straight lines
* Defines an arc, a sector, a chord and a segment of a circle
* Determines arc length, given radius and angle of sector
* States that angles subtended by a chord in the same segment of a circle are equal
* States that the angle subtended by a chord at the center of a circle is twice the angle subtended at the circumference
* States that the angle subtended at the circumference by a diameter is a right angle
* Defines a quadrilateral, a parallelogram, a trapezium and a rhombus
* Calculates areas of sectors and segments of a circle
* Explains and applies Simpson's first, second and five-eighth rule for their use in the computation of areas, volumes and centroids (no derivations required)
* Constructs:

 - a perpendicular to a line from a given point  - a perpendicular to a line at a given point on the line  - a tangent to a circle  - the perpendicular bisector of a line  - the bisector of an angle * Divides a line into a given number of equal parts
* Determines:

 - the circumcentre of a triangle  - the in-center of a triangle * Defines a median of a triangle
* Defines the centroid of a triangle and determines centroids by construction
* Given three points and the angles subtended by pairs of those points at a position, determines the position by plotting
1. **SPHERICAL TRIANGLES**
* Defines a great circle, small circle, pole and a small circle
* Defines a spherical triangle as a figure on the surface of a sphere bounded by arcs of three great circles
* Defines the angle between two great circles as the angle between the planes in which they lie
* Describes how the length of a side is measured as an angle
* States that the sum of the angles of a spherical triangle exceeds 180o but is less than 540o
* States that no side exceeds 180o
* Explain right-angled spherical triangles and their properties
* Explain Napier’s rule for right angled spherical triangles and quadrantal spherical triangles
* Explain polar triangles and their application in the solution of spherical triangles
* Given two parts of a right-angled spherical triangle, uses Napier's rules to solve for any other part
* States what is meant by a quadrantal triangle 6
* Given two parts of a quadrantal triangle, uses Napier's rules to solve for any other part solves problems involving oblique spherical triangles by use of the cosine and sine formulae
* Uses the haversine formula to solve right-angled spherical triangle and explains its advantage over the sine and cosine formulae

 solves problems on spherical triangles by dropping a perpendicular and solving the resulting right-angled triangle1. **BASIC STATISTICS**
* Basic concept of statistics
* Collection, processing, presentation and data analysis
* Finding and interpreting of central tendency and variance
* Probability theory – classical and empirical probability
* Probability distribution and discrete random variables
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| Teaching Methodology | Lectures, tutorials and assignments |
| Bibliography | **Required Textbooks/Reading:**

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| **Authors** | **Title** | **Publisher** | **Year** | **Library Access** |
| M. Sullivan and M. Sullivan III | Precalculus | Pearson | 20177th Edition | Print copy at library |

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| **Authors** | **Title** | **Publisher** | **Year** | **Library Access** |
| H. Anton, I. Bivens, S. Davis III | Calculus | Wiley | 201210th Edition | Print copy at library |

**Recommended Textbooks/Reading:**

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| **Authors** | **Title** | **Publisher** | **Year** | **Library Access** |
| M. Bittinger, J. Beecher, D. Ellenbogen, J. Penna | Precalculus: Graphs and Models | Pearson | 20176th Edition | Print copy at library |

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| Assessment | Midterm Exam, Final Exam, Assignments |
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