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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 | | | | | | | |
| 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 | | | | | | | |
| 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 equations   1. **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 triangle   1. **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 | | | | | | | |
| Teaching Methodology | Lectures, tutorials and assignments | | | | | | | |
| Bibliography | **Required Textbooks/Reading:**     |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Authors** | **Title** | **Publisher** | **Year** | **Library Access** | | M. Sullivan and M. Sullivan III | Precalculus | Pearson | 2017  7th Edition | Print copy at library |  |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Authors** | **Title** | **Publisher** | **Year** | **Library Access** | | H. Anton, I. Bivens, S. Davis III | Calculus | Wiley | 2012  10th Edition | Print copy at library |   **Recommended Textbooks/Reading:**   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Authors** | **Title** | **Publisher** | **Year** | **Library Access** | | M. Bittinger, J. Beecher, D. Ellenbogen, J. Penna | Precalculus: Graphs and Models | Pearson | 2017  6th Edition | Print copy at library | | | | | | | | |
| Assessment | Midterm Exam, Final Exam, Assignments | | | | | | | |
| Language | English | | | | | | | |
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