Darrang College (Autonomous), Tezpur-784001

Syllabus for FYUGP

Sub: MATHEMATICS (MINOR)

Approved by :

Board of Studies meeting held on 13-06-2026 &

Academic Council vide Resolution no. DC/AC/3/2026/02 dated-29th June, 2026

Minor Subjects

CURRICULUM COMPONENTS:

- **B.A. / B.Sc. Minor Course Distribution for Four years:**

Year	Semester	Course Title	Paper Code	Credit
Year-I	**1st Sem**	Algebra-I	MAT-MN-01014	4
	2nd Sem	Calculus	MAT-MN-02014	4
Year-II	**3rd Sem**	Ordinary Differential Equations	MAT-MN-03014	4
	4th Sem	Analytical Geometry	MAT-MN-04014	4
Year-III	**5th Sem**	Multivariate Calculus	MAT-MN-05014	4
	6th Sem	Partial Differential Equations	MAT-MN-06014	4
Year-IV	**7th Sem**	Numerical Analysis	MAT-MN-07014	4
	8th Sem	Complex Analysis	MAT-MN-08014	4
			(Total Credit)	**32**

FOUR YEAR UNDERGRADUATE PROGRAMME IN MATHEMATICS
SEMESTER-I

Title of the course	**Algebra-I**
Course code	MAT-MN-01014
Nature of Course	Major
Total Credit	04 (Theory: 04 + Practical: 00)
Contact Hours	60
Total Marks	100 (End Term: 60, Internal Assessment: 40)
Prerequisites	Mathematics in 10+2 or equivalent standard.

Course Objectives: The primary objective of this course is to explain students about the general structure of equations, fundamental concepts of mathematical logic and reasoning, basic concepts of set theory. Furthermore, basic concepts of matrices will be taught to them.

Learning Outcome: This course will enable the students to:

- Learn how to deal with mathematical statements which are composite or with quantifiers, also, statements with implications.
- Learn the basics of set theory including partial order relation, countability of sets.
- Recognize consistent and inconsistent systems of linear equations by the row echelon form of the augmented matrix, also, finding inverse and rank of a matrix.
- Determine the number of positive/negative real roots of a real polynomial using Descartes' rule of sign, also, learn about symmetric functions of the roots for cubic and biquadratic equations.
- Learn how to solve cubic equations.

Unit	Content	L	T	P	Total Hrs
I	**Mathematical Statement and Logic:** Mathematical statement, Statement with quantifiers "*there exists"* and *"for every*", Compound statement using *"or"* and *"and",* Statements with implications: *"if-then"* statement and *"if and only if"* statement, Contra-positive statement, The Induction Principle, [1] Chapter: 1(Sections: 1.1, 1.2 upto Exercise 1.2.13, 1.3 up-to Exercise 1.3.8, 1.4), Chapter: 5 (Section: 5.1) (15 Marks)	12	02	--	14

II	**Basics of set theory:** Partial order relation, poset, chain, upper and lower bounds in poset, greatest element and least elements, maximal and minimal elements, supremum and infimum, Zorn's Lemma, Definition of finite and infinite sets, countable and uncountable sets. [1] Chapter:6 (Sections: 6.2, 6.3), Chapter: 7 (Sections: 7.1, 7.2) (15 Marks)	13	02	--	15
III	**Matrices:** Elementary operations on a matrix, Matrix inversion and properties, Rank of a matrix, Determination of rank by reduction into echelon form, Symmetric matrix, Hermitian matrix, Elementary matrices and equivalence Consistency of linear systems, Solutions of system of homogeneous linear equations. [2] Chapter: 3 (Sections: 3.7), Chapter: 2 (Sections: 2.1 to 2.4) (15 Marks)	13	02	--	15
IV	**Theory of Equations:** Polynomial and Polynomial Equations, Deduction from Fundamental Theorem of Classical Algebra, Descartes' rule of signs, Relation between roots and coefficients of a polynomial equation of degree n, Symmetric functions of roots for cubic and biquadratic equations, Transformation of equations, Cardan's method of solution of a cubic equation. [3] Chapter: 5 (Sections: 5.1, 5.3.4, 5.4, 5.5, 5.6 upto 5.6.3, 5.11.2) (15 Marks)	13	03	--	16

Text Books:

1. Kumar, A., Kumaresan, S. and Sarma, B.K., (2018*). A Foundation Course in Mathematics*, Narosa.
2. Meyer, Carl .D., (2000). *Matrix Analysis and Applied Linear Algebra*, Society for Industrial and Applied Mathematics (Siam). https://vik.wiki/images/2/21/FmLinalg_jegyzet_2000_Meyer.pdf
3. Mappa, S.K., (2011). *Higher Algebra (Classical)* (Revised 8th Edition), Levant Books.
4.

Reference Books:

1. Andreescu, T. and Andrica, D., (2014). *Complex numbers from A to...Z.* (2nd Edition), Birkhäuser.
2. Dickson, Leonard E., (2009). *First Course in the Theory of Equations,* John Wiley & Sons, Inc. The Project Gutenberg, eBook: http://www.gutenberg.org/ebooks/29785.
3. Halmos, P. R., (2009). *I Set Theory,* Springer.

FOUR YEAR UNDERGRADUATE PROGRAMME IN MATHEMATICS

SEMESTER-II

Title of the course	**Calculus**
Course code	MAT-MN-02014
Nature of Course	Minor
Total Credit	04 (Theory: 04 + Practical: 00)
Contact Hours	60
Total Marks	100 (End Term: 60, Internal Assessment: 40)
Prerequisites	Mathematics in 10+2 or equivalent std.

Course Objectives: The primary objective of this course is to develop a deep and rigorous understanding of real analysis including real numbers, convergence and divergence of sequences and series of real numbers, also understand the quantitative change in the behavior of the variables and apply basic tools of calculus which are helpful in understanding their applications in many real world problems.

Learning Outcome: This course will enable the students to:

- Understand many properties of the real line R, including completeness and Archimedean properties.
- Learn to define sequences in terms of functions from N to a subset of R.
- Recognize bounded, convergent, divergent, Cauchy and monotonic sequences and to calculate their limit superior, limit inferior, and the limit of a bounded sequence.
- Apply limit comparison tests for convergence of an infinite series of real numbers.
- Understand continuity and differentiability in terms of limits.
- Describe asymptotic behavior in terms of limits involving infinity.

UNIT	CONTENT	L	T	P	Total Hrs
I	**Basic concepts of real numbers:** Algebraic and order properties of R, absolute value and real line, bounded sets, supremum and infimum, completeness property of R, the Archimedean property. **[1]** Chapter:2 (Sections 2.1-2.4.6) **(15 Marks)**	12	03	--	15
II	**Sequence** Real sequences, limit of a sequence, convergent sequence, bounded sequence, Limit theorems, monotone sequences, Monotone convergence theorem, Subsequences and the Bolzano Weierstrass theorem, monotone subsequence theorem, Cauchy sequences, Cauchy's convergence criterion, properties of divergence sequences **[1]** Chapter:3 (Sections 3.1 to 3.6) **(20 Marks)**	16	04	--	20

III	**Infinite series**: Convergence and divergence of infinite series, Cauchy criterion, Tests for convergence: comparison test, limit comparison test, ratio test and root test. **[1]** Chapter 3 (Section 3.7) **(10 Marks)**	07	03	--	10
IV	**Limits, Continuity and Differentiability :** Limit of a function, Continuity and types discontinuities. Differentiability of a function, Successive differentiation: Calculation of the nth derivatives, Leibnitz theorem, Infinite limits, Indeterminate forms. [2] Chapter 3 (Sections 3.1-3.3, 3.5-3.8), Chapter 4 (Sections 4.1, 4.2, 4.4-4.6, 4.8,4.9), Chapter 5 and Chapter 10 (Sections 10.1-10.3) **(15 Marks)**	13	02	--	15

Text books:

1. Bartle, R. G. and Sherbert, D. R., (2002). *Introduction to Real Analysis* (3rd Edition), JohnWiley and Sons. https://sowndarmath.wordpress.com/wp-content/uploads/2017/10/real-analysis-by-bartle.pdf
2. Narayan, S. and Mittal, P.K., (2017). *Differential Calculus*, S. Chand.

Reference book:

1. Kumar, A. and Kumaresan, S., (2014). *Basic Course in Real Analysis*, CRC Press.
2. Thomas Jr,. G. B., Weir, M. D., and Hass, J., (2014). *Thomas' Calculus* (13th Edition), Pearson. https://rodrigopacios.github.io/mrpacios/download/Thomas_Calculus.pdf
3. Anton, H., Bivens, I. and Davis, S. F., (2013). *Calculus (*10th Edition). John Wiley & Sons Singapore Pte. Ltd. Reprint (2016) by Wiley India Pvt. Ltd. Delhi.https://3lihandam69.wordpress.com/wp-content/uploads/2018/10/calculus-10th-edition-anton.pdf

FOUR YEAR UNDERGRADUATE PROGRAMME IN MATHEMATICS
SEMESTER-III

Title of the course	**Ordinary Differential Equations**
Course code	MAT-MN-03014
Nature of Course	Minor
Total Credit	04 (Theory: 04+ Practical: 00)
Contact Hours	60
Total Marks	100 (End Term: 60, Internal Assessment: 40)
Prerequisites	MAT-MN-02014

Course Objectives: The main objective of this course is to introduce the students to the exciting world of differential equations and their solutions methods.

Course Learning Outcomes: The course will enable the students to:

- Learn basics of 1st order ordinary differential equations and 2nd order linear differential equations
- Learn different techniques for solving the differential equations

UNIT	CONTENT	L	T	P	Total Hrs
I	**First Order Ordinary Differential Equations**: Classification of differential equations; their origin and application. Solutions. Initial-Value Problems, Boundary-Value Problems, and Existence of solutions. First order exact differential equation. Integrating factors, Rules to find an integrating factor. Linear equations and Bernoulli equations. Special Integrating Factors and Transformations **[1]** Chapter 1 & Chapter 2 **(20 Marks)**	17	03	--	20
II	**Higher-Order Linear Differential Equations** : Basic Theory of Linear Differential Equations, Linear homogenous equations with constant coefficients, the method of undetermined coefficients, the method of Variation of Parameters. The Cauchy-Euler equations; Statements and Proofs of Theorems on the Second-Order Homogeneous Linear Equation **[1]** Chapter 4 (Sections 4.1-4.5) (25 **Marks)**	22	03	--	25
III	Application of ordinary differential equation: Orthogonal and Oblique Trajectories, Problems in Mechanics, Rate Problems, Vibrations of a Mass on a Spring, Free; Undamped Motion, Free; Damped Motion. **[1]** Chapter 3 and Chapter 5 (Sections 5.1-5.3) **(15 Marks)**	12	03	--	15

Text Book:

[1] Ross, Shepley L. (1984). Differential Equations (3rd Ed.), John Wiley & Sons,Inc.

Reference Book:

1.Kreyszig, Erwin (2011). Advanced Engineering Mathematics(10th ed.).John Wiley & Sons, Inc. Wiley India Edition 2015.

FOUR YEAR UNDERGRADUATE PROGRAMME IN MATHEMATICS

SEMESTER-IV

Title of the course	**Analytical Geometry**
Course code	MAT-MN-04014
Nature of Course	Minor
Total Credit	04 (Theory: 04+ Practical: 00)
Contact Hours	60
Total Marks	100 (End Term: 60, Internal Assessment: 40)
Prerequisites	Mathematics in 10+2 or equivalent std.

Course Objectives: The primary objective of this course is to introduce some basic tools of two dimensional and three-dimensional coordinate systems and also to familiarize the use of vector algebra in coordinate geometry.

Course Learning Outcomes: The course will enable the students to:

- Define Vector Algebra and represent the use of geometric view of vectors in Coordinate Geometry.
- Recognize three dimensional surfaces represented by equations of the second degree.
- Change the coordinate systems, Explain pair of straight lines, conic sections and related properties.
- Express systems of coordinates which are very useful to define the position of a point in space.

UNIT	CONTENT	L	T	P	Total Hrs
I	Transformation of coordinates, invariants under orthogonal transformations, pair of straight lines. [1] Chapter 1 (Section 1.3), Chapter 2, Chapter 3 (**15 Marks)**	15	03	--	18
II	Parabola, parametric coordinates, tangent and normal, ellipse and its conjugate diameters with properties, hyperbola and its asymptotes, General conics: tangent, condition of tangency, pole and polar, centre of a conic, equation of pair of tangents, reduction to standard forms, central conics, equation of the axes, and length of the axes, polar equation of a conic, tangent and normal, and properties. [1] Chapters 4, 5, 6, 7, 9 (upto Section 9.43) (15 **Marks)**	15	03	--	18
III	Quadric surfaces:Sphere, Cylinder and Cone. Cylindrical and spherical polar coordinates. [1] Chapter 6 (Section 6.1 – 6.3), Chapter 12 (**15 Marks)**	10	02	--	12

IV	Rectangular coordinates in 3-space, Vector viewed geometrically, Vectors in coordinates system, Vectors determined by length and angle, Dot product, Cross product and their geometrical properties, Triple product, Parametric equations of lines in 2-space and 3-space. [2] Chapter 11 (Section 11.1 - 11.5) **(15 Marks)**	10	02	--	

Text Book:

[1] R.M. Khan, Analytical Geometry of two and three dimensions and Vector Analysis. New Central Book Agency, 2012.

[2] Anton, Howard, Bivens, Irl, & Davis, Stephen (2013), Calculus (10th ed.). John Wiley & Sons, Singapore Reprint (2016) by Wiley India Pvt. Ltd., Delhi.

Reference Book:

1. R.J.T. Bell, Coordinate Solid Geometry, Macmillan, 1983.

2. E.H. Askwith, The Analytical Geometry of the Conic Sections, Nabu Press (27 February 2012)

3. B. Das, Analytical Geometry and Vector Analysis, Orient Book Company, Kolkata - 700007.

FOUR YEAR UNDERGRADUATE PROGRAMME IN MATHEMATICS
SEMESTER-V

Title of the course	**Multivariate Calculus**
Course code	MAT-MN-05014
Nature of Course	Minor
Total Credit	04 (Theory: 04+ Practical: 00)
Contact Hours	60
Total Marks	100 (End Term: 60, Internal Assessment: 40)
Prerequisites	MAT-MN-02014 & MAT-MN-04034

Course Objectives: To understand the extension of the studies of single variable differential and integral calculus to functions of two or more independent variables. This course will facilitate to become aware of applications of multivariable calculus tools in physics, economics, optimization, and understanding the architecture of curves and surfaces in plane and space etc.

Course Learning Outcomes: The course will enable the students to:

- Identify the conceptual variations when advancing in calculus from one variable to multivariable discussion.
- Describe the maximization and minimization of multivariable functions subject to the given constraints on variables.
- Explain about basic concept of the line integral

UNIT	CONTENT	L	T	P	Total Hrs
I	Functions of several variables, Level curves and surfaces, Limits and continuity, Partial differentiation, Chain rule, Directional derivatives and the gradient, Maximal property of the gradient, Extrema of functions of two variables, Method of Lagrange multipliers. [1] Chapter11 [(Sections 11.1, 11.2, 11.5, 11.6 (upto page 743), 11.7 (upto page 754), 11.8 (pages 761-765)] **(15 Marks)**	15	03	--	18
II	Double integration over rectangular regions, Double integrals in polar coordinates, Triple integral over a parallelepiped and solid regions, Volume by triple integrals. [1] Chapter 12 (Sections 12.1 upto page 782, 12.3, 12.5)] **(15 Marks)**	20	04	--	24
III	Properties of a vector field: Divergence and Curl, Line integrals, Properties of line integrals, Green's theorem, Area as a line integral, Surface integrals, Stokes' theorem, The Gauss divergence theorem. [1] Chapter13[(Section 13.1, 13.2 (upto page 872), 13.4 (upto page 891), 13.5 (upto page 900), 13.6 (upto page 911), 13.7 (upto page 918) **(25 Marks)**	15	03	--	18

Text Book:

[1] Strauss, Monty J., Bradley, Gerald L.,& Smith, Karl J.(2007). Calculus (3rded.). Dorling Kindersley (India)Pvt. Ltd. (Pearson Education). Delhi. IndianReprint2011.

Reference Book:

1. Marsden, J.E., Tromba, A., & Weinstein,A.(2004).Basic Multivariable Calculus. Springer (SIE). First Indian Reprint.

2. G.B.Thomas and R.L.Finney,Calculus,9thEd.,Pearson Education,Delhi,2005. 3. James Stewart, Multivariable Calculus, Concepts and Contexts, 2nd Ed., Brooks /Cole, Thomson Learning, USA, 2001.

FOUR YEAR UNDERGRADUATE PROGRAMME IN MATHEMATICS

SEMESTER-VI

Title of the course	**Partial Differential Equations**
Course code	MAT-MN-06014
Nature of Course	Minor
Total Credit	04 (Theory: 04+ Practical: 00)
Contact Hours	60
Total Marks	100 (End Term: 60, Internal Assessment: 40)
Prerequisites	MAT-MN-03014

Course Objectives: The main objectives of this course are to teach students to form and solve partial differential equations and use them in solving some physical problems.

Course Learning Outcomes: The course will enable the students to:

- Formulate, classify and transform first order PDEs into canonical form.
- Explain method of characteristics, separation of variables and solve first order PDE's.
- Classify and solve second order linear PDEs.
- Discuss Cauchy problem for second order PDE and homogeneous and non-homogeneous wave equations.
- Apply the method of separation of variables for solving many well-known second-order PDEs.

UNIT	CONTENT	L	T	P	Total Hrs
I	Introduction, Classification, Construction of first order partial differential equations (PDE). Cauchy's problem for first order equations, linear equations of the first order, Integral surfaces passing through a given curve, Nonlinear partial differential equations of the first order, Cauchy's method of characteristics, Charpit's method. Solutions satisfying given conditions, Jacobi's method. [1] Chapter 2 (Sections 2.1 to 2.3), [2] Chapter 2 (Section 3, 4,5, 7,8,10,12, 13) **(15 Marks)**	20	3	--	23
II	Canonical form of first order PDE, Method of separation of variables for first order PDE. [1] Chapter 2 (Sections 2.6 and 2.7) **(15 Marks)**	15	3	--	18
III	Reduction to canonical forms, Equations with constant coefficients, General solution. [1] Chapter 4 (Sections 4.1 to 4.5), [2] Chapter 3 (Sections 4, 5) **(15 Marks)**	16	3	--	19

Text Book:

1. Tyn Myint-U and Lokenath Debnath, Linear Partial Differential Equation for Scientists and Engineers, Springer, Indian reprint, 2006.
2. Sneddon, I. N. (2006). Elements of Partial Differential Equations, Dover Publications. Indian Reprint.

Reference Book:

1. Stavroulakis, Ioannis P & Tersian, Stepan A. (2004). Partial Differential Equations: An Introduction with Mathematica and MAPLE (2nd ed.). World Scientific.
2. M. D. Raisinghania, Advanced Differenti al Equations, S. Chand & Company LTD.

FOUR YEAR UNDERGRADUATE PROGRAMME IN MATHEMATICS

SEMESTER-VII

Title of the course	**Numerical Analysis**
Course code	MAT-MN -07014
Nature of Course	Major
Total Credit	04 (Theory: 04 + Practical: 00)
Contact Hours	60
Total Marks	100 (End Term: 60, Internal Assessment:40)
Prerequisites	Mathematics in 10+2 or equivalent std.

Course Objectives: To comprehend various computational techniques to find approximate value for possible root(s) of non-algebraic equations, to find the approximate solutions of system of linear equations and Quadratic equations.

Course Learning Outcomes: The course will enable the students to:

- Learn some numerical methods to find the zeroes of nonlinear functions of a single variable and
  solution of a system of linear equations, up to a certain given level of precision.
- Know about iterative and non-iterative methods to solve system of linear equations
- Know interpolation techniques to compute the values for a tabulated function at points not in
  the table.
- Integrate a definite integral that cannot be done analytically
- Find numerical differentiation of functional values
- Solve differential equations that cannot be solved by analytical methods

UNIT	CONTENT	L	T	P	Total Hrs
I	Taylor's Theorem, errors in arithmetic operations, absolute and relative error, truncation and round off errors. **[1]** Chapter 1 (Sections 1.1, 1.3 (1.3.1-1.3.4)) **(5 Marks)**	04	01	--	05
II	Calculus of finite difference: different interpolation formulae with remainder terms, finite difference operators and their operations on function of a single variable, interpolation with equal and unequal intervals, Newton;s formulae, Lagrange's formula, Gauss, Bessel and sterling's formula, Hermite interpolation. **[2]** Chapter 1 (1.8, 1.8.1,1.8.2), Chapter 2, Chapter 3 (Sections 3.1-3.5) **(15 Marks)**	13	02	--	15

III	Numerical differentiation and integration: Numerical differentiation with the help of different interpolation formulae, general quadrature formula, trapezoidal rule. Simpson's one third and three eighth rule. Weddel's rule, Newton-Cote's formula. **[1]** Chapter 4 (Sections 4.1-4.4) , Chapter 7 (Section 7.1-7.5 and 7.6.2) **(15 Marks)**	13	02	--	15
IV	Solution of polynomial and transcendental equations: Bisection method, secant method, regula falsi method, Newton-Raphson method, rate of convergence, Chebyshev Method and comparison of methods. **[1]** Chapter 3 (Sections 3.1-3.4, 3.6, 3.8 and 3.10) **(10 Marks)**	08	02	--	10

Text Books:

1. Rao-V.-Dukkipati, Numerical-Methods, New Age International Publishers, 2010.
2. H.C. Saxena, Finite Differences and Numerical Analysis, S. Chand Company, 2008.

Reference Book:

1. Fausett, Laurene V. (2009). *Applied Numerical Analysis Using* MATLAB. Pearson. India
2. Jain, M.K., Iyengar, S.R.K., & Jain R.K.(2012). *Numerical Methods for Scientific and Engineering Computation* (6th ed.). New Age International Publishers. Delhi.

FOUR YEAR UNDERGRADUATE PROGRAMME IN MATHEMATICS

SEMESTER-VIII

Title of the course	**Complex Analysis**
Course code	MAT-MN-08014
Nature of Course	Major
Total Credit	04 (Theory: 04 + Practical: 00)
Contact Hours	60
Total Marks	100 (End Term: 60, Internal Assessment:40)
Prerequisites	Mathematics in 10+2 or equivalent std.

Course Objectives: The main objective of this course is to develop a deep understanding of the complex plane together with various related concepts. These concepts have wide applicability in different aspects.

Course Learning Outcomes: The completion of the course will enable the students to:

- Learn the significance of differentiability of complex functions leading to the understanding of Cauchy−Riemann equations.
- Learn some elementary functions and valuate the contour integrals.
- Understand the role of Cauchy-Goursat theorem and the Cauchy integral formula

UNIT	CONTENT	L	T	P	Total Hrs
I	Polar representation of complex numbers, De Moivre's Theorem (both integral and rational index) and its applications, Roots of a complex number, n^{th} roots of unity. Functions of complex variable, mappings, limits, theorems on limits, limits involving point at infinity, continuity. Derivatives, rules for differentiation, Cauchy-Riemann equations, sufficient conditions for differentiability, polar co-ordinates. **[1]:** Chapter 1 (Section 6-9), Chapter 2 (Section 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24) **(15 Marks)**	13	02	--	15
II	Analytic functions, examples of analytic functions, harmonic function. The exponential function, Logarithmic function, examples, branches and derivatives of logarithms, some identities involving logarithms, the power function, trigonometric function, zeros and singularities of trigonometric functions derivatives of functions, definite integrals of functions. **[1]:** Chapter 2 (Sections 25, 26, 27), Chapter 3 (Sections 30, 31,32,33,34, 35, 36, 37, 38),	08	02	--	10

	Chapter 4(Section 41, 42) **(10 Marks)**				
III	Contours, Contour integrals and its examples, upper bounds for moduli of contour integrals, antiderivatives, proof of antiderivative theorem. **[1]:** Chapter 4 (Section 43, 44, 45,47, 48, 49) **(10 Marks)**	08	02	--	10
IV	Cauchy-Goursat theorem, simply connected domains, multiply connected domains, Cauchy integral formula, extension of Cauchy integral formula, Liouville's theorem and the fundamental theorem of algebra. **[1]:** Chapter 4 (Sections 50, 52, 53, 54, 55, 58) **(10 Marks)**	08	02	--	10

Text Book:

1. James Ward Brown and Ruel V. Churchill, Complex Variables and Applications (Ninth Edition), McGraw-Hill Indian Edition, 2021.

Reference Book:

1. Joseph Bak and Donald J. Newman, *Complex analysis* (2nd Edition), Undergraduate Texts in
2. Mathematics, Springer-Verlag New York, Inc., New York, 1997.
3. M.R. Spiegel, *Complex Variables*. Schaum's Outlines series, McGraw Hill Education, 2017.