University of Kerala
Thiruvananthapuram, Kerala, India 695 034
(Established as University of Travancore by the Travancore University Act in 1937and reconstituted as University of Kerala by the Kerala University Act of 1957 and presently governed by the Kerala University Act of 1974 passed by the Kerala State Legislative Assembly)
(Re-accredited by NAAC with 'A' Grade)

No.Ac.AV/1/2019 Thiruvananthapuram
Dated:04-10-2019

From
The Registrar

To
The Principals of all Colleges
offering First Degree Programme under CBCS system.

Sir,

Sub:- Printing error in the Syllabus of Complementary Course in Mathematics for Career-related First Degree Programmes in Computer Science, Chemistry and Industrial Chemistry and Physics and Computer Application under CBCS system, revised w.e.f 2019 admissions - correction- reg

Ref:- Minutes of the Additional meeting of the Board of Studies in Mathematics (Pass) dated 19.08.2019

With reference to the above,I am to inform you that certain typographical errors has been occurred while printing the Syllabus of Complementary Course in Mathematics offered to career-related First Degree Programmes in Computer Science,Chemistry and Industrial Chemistry and Physics and Computer Application under CBCS system, revised w.e.f 2019 admissions .

1.The following are the prescribed texts in the Syllabus of MM 1131.10 Complementary Course in Mathematics offered to career-related First Degree Programmes in Computer Science.

i. Calculus by Howard Anton,Irl C Bevens,Stephen Davis,10th edition,John Wiley & Sons.
ii. B S Grewal,higher Engineering Mathematics,42nd Edition,Khanna Publishers.
Iii. Differential Equations and Their Applications.Second Edition,Prentice Hall of India.
iv. Lincy N Childs, A Concrete Introduction to Higher Algebra,Second Edition.

Prescribed Text for the Course and the concerned sections of the topics are mentioned in the corrected syllabus (corrected syllabus are available in the University website)

2.Instructional hours per week and number of credits of MM 1131.7 and MM 1231.7 for Chemistry and Industrial Chemistry of the Semester I and II and MM 1131.6,MM 1231.6,MM 1331.6 and MM 1431.6 for Physics and Computer Application of the Semester I-IV, are wrongly typed as 4 hours and 3 credits instead of 5 hours and 4 credit.

Instructional hours for each module in the syllabus of MM 1131.7 and MM 1231.7 are to be changed as follows.

Module I – 18 hours
Module II – 24 hours
Module III – 24 hours
Module IV – 24 hours

The above matter may be brought to the notice of all concerned.

Yours faithfully

Sd/-
Deputy Registrar(Acad-II)
For Registrar

Syllabus for the Complementary course in Mathematics for the First Degree Programme in Chemistry and Industrial Chemistry

UNIVERSITY OF KERALA

Semester I

MATHEMATICS I
(Calculus, Complex Numbers and Vector Algebra)
Code: MM1131.7

Instructional hours per week: 5 **No. of Credits: 4**

MODULE 1

Differentiation and its Applications 18 Hours

Differentiation (a review) - Leibnitz theorem - Special points of a function - Curvature - Theorems of Differentiation - Mean Value Theorem - Rolle's Theorem.

The topics in this module can be found in Chapter 2, sections 2.1 ***of*** **Text [1].**

More exercises related to the topics in this module can be found in Chapter 2 and Chapter 3 of **Reference [1].**

MODULE 2

Integration and its Apllications 24 Hours

Integration by parts - Reduction formulae - Infinite and Improper Integrals - Plane polar coordinates - Integral inequalities - Applications of Integration (Mean Value of function, Length of Curve, Surface Area of revolution, Volume of revolution.)

The topics in this module can be found in Chapter 2, sections 2.2.8 ***to*** 2.2.13 ***of*** **Text [1].**

More exercises related to the topics in this module can be found in Chapter 4, Chapter 5 and Chapter 7 of **Reference [1].**

MODULE 3

Complex Numbers 24 Hours

de Moivress Theorem - Trigonometric identities - Finding the nth roots of unity - Solving polynomial equations - Complex logarithms and complex powers - Applications to differentiation and integration - Hyperbolic functions - Inverses of hyperbolic functions - Calculus of hyperbolic functions.

The topics in this module can be found in Chapter 3, sections 3.4 ***to*** 3.7 ***of*** **Text [1].**

More exercises related to the topics in this module can be found in Chapter 6 of **Reference [1]** *and Chapter 13 of* **Reference [3].**

MODULE 4

Vector Algebra 24 Hours

Scalar Triple Product - Vector triple product - Equations of lines, planes and spheres - Using vectors to find distances - Reciprocal vectors

The topics in this module can be found in Chapter 7, sections 7.6 ***to*** 7.9 ***of*** **Text [1].**

More exercises related to the topics in this module can be found in Chapter 11 of **Reference [1]** *and Chapter 6 of* **Reference [2].**

Text

1 **K F Riley, M P Hobson, S J Bence,** *Mathematical Methods for Physics and Engineering*, 3rd Edition, Cambridge University Press.

References

1 **Howard Anton, Irl C. Bivens, Stephen Davis,** *Calculus*, 10th Edition, John Wiley & Sons.

2 **Mary L Baos**, *Mathematics Methods in the Physical Sciences,* 3rd Edition, Wiley.

3 **Erwin Kreyszig**, *Advanced Engineering Mathematics*, 10th Edition, Wiley-India.

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Syllabus for the Complementary course in Mathematics for the First Degree Programme in Chemistry and Industrial Chemistry

UNIVERSITY OF KERALA

Semester II

MATHEMATICS II
(Parial Differentiation, Vector Differentiation, Infinite Series and Multiple Integrals)
Code: MM1231.7

Instructional hours per week: 5 **No. of Credits: 4**

MODULE 1

Partial Differerentiation 18 Hours

The total differential and total derivative - Exact and inexact differentials - Theorems of partial differentiation - The chain rule - Change of variables - Taylors theorem for many-variable functions - Stationary values of many-variable functions - Stationary values under constraints.

The topics in this module can be found in Chapter 5, sections 5.1 ***to*** 5.9 ***of*** **Text [1].**

More exercises related to the topics in this module can be found in Chapter 13 of **Reference [1].**

MODULE 2

Vector Calculus - Differentiation 24 Hours

Differentiation of vectors -Differentiation of composite vector expressions - Differential of a vector - Integration of vectors - Space curves - Vector functions of several arguments - Surfaces - Scalar and vector fields - Vector operators - Gradient of a scalar field - Divergence of a vector field - Curl of a vector field - Vector operator formulae - Vector operators acting on sums and products - Combinations of grad, div and curl - Cylindrical and spherical polar coordinates - Cylindrical polar coordinates - Spherical polar coordinates.

The topics in this module can be found in Chapter 10, sections 10.1 ***to*** 10.9 ***of*** **Text [1].**

More exercises related to the topics in this module can be found in Chapter 3 of **Reference [3].**

MODULE 3

Infinite Series 24 Hours

Summation of series - Arithmetic series - Geometric series - Arithmetico-geometric series - The difference method - Series involving natural numbers - Transformation of series - Convergence of infinite series - Absolute and conditional convergence - Convergence of a series containing only real positive terms - Alternating series test - Operations with series - Power series - Convergence of power series - Operations with power series - Taylor series - Taylors theorem (Proof excluded) - Approximation errors in Taylor series - Standard Maclaurin series.

The topics in this module can be found in Chapter 4, sections 4.1 ***to*** 4.6 ***of*** **Text [1].**

More exercises related to the topics in this module can be found in Chapter 9 of **Reference [1]** *and Chapter 1 of* **Reference [2].**

MODULE 4

Multiple Integrals 24 Hours

Double integrals - Triple integrals - Applications of multiple integrals - Areas and volumes only (Masses, centres of mass and centroids - Pappus theorems - Moments of inertia - Mean values of functions are excluded) - Change of variables in multiple integrals - Change of variables in double integrals- Evaluation of some special infinite integrals - Change of variables in triple integrals - General properties of Jacobians.

The topics in this module can be found in Chapter 6, sections 6.1 ***to*** 6.4 ***of*** **Text [1].**

More exercises related to the topics in this module can be found in Chapter 14 of **Reference [1]** *and Chapter 6 of* **Reference [2].**

Text

1 K F Riley, M P Hobson, S J Bence, *Mathematical Methods for Physics and Engineering*, 3rd Edition, Cambridge University Press.

References

1 Howard Anton, Irl C. Bivens, Stephen Davis, *Calculus*, 10th Edition, John Wiley & Sons.

2 Mary L Baos, *Mathematics Methods in the Physical Sciences,* 3rd Edition, Wiley.

3 George B Arfken, Hans J Weber, Frank E Harris, *Mathematical Methods for Physcists*, 7th Edition, Academic Press.

4 Erwin Kreyszig, *Advanced Engineering Mathematics*, 10th Edition, Wiley-India.

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Syllabus for the Complementary course in Mathematics for the First Degree Programme in Chemistry and Industrial Chemistry

UNIVERSITY OF KERALA

Semester III

MATHEMATICS III
(Theory of Matrices, Vector Integration, Special Functions and Theory of Equations)
Code: MM1331.7

Instructional hours per week: 5 **No. of Credits: 4**

MODULE 1

Theory of Matrices 24 Hours

Matrices and row reduction - Determinants - Cramers Rule for solving system of equations - Vectors - Lines and Planes - Linear Combinations - Linear Functions - Linear Operators - Linear Dependence and Independence - Special Matrices like Hermitian matrices and Formulas - Linear Vector Spaces - Eigenvalues and Eigenvectors - Diagonalizing Matrices - Applications of Diagonalization.

The topics in this module can be found in Chapter 3 of **Text [2].**

More exercises related to the topics in this module can be found in Chapter 7 and 8 of **Reference [3].**

This topics can be referred in **Reference [4].**

MODULE 2

Vector Calculus - Integration 24 Hours

Evaluating Line integrals - Physical examples of line integrals - Line integrals with respect to a scalar - Connectivity of regions - Greens theorem in a plane - Conservative fields and potentials - Surface integrals - Evaluating surface integrals - Vector areas of surfaces - Physical examples of surface integrals - Volume integrals - Volumes of three-dimensional regions - Integral forms for grad, div and curl - Greens theorems (without proof) - Other related integral theorems - Physical applications of the divergence theorem - Stokes theorem and related theorems (without proof) - Related integral theorems - Physical Applications.

The topics in this module can be found in Chapter 11 of **Text [1].**

More exercises related to the topics in this module can be found in Chapter 3 of **Reference [2].**

MODULE 3

Special Functions 18 Hours

The Factorial Function - Definition of the Gamma Function - Recursion Relation - The Gamma Function of Negative Numbers - Some Important Formulas Involving Gamma Functions - Beta Functions - Beta Functions in Terms of Gamma Functions.

The topics in this module can be found in Chapter 11 of **Text [3].**

More exercises related to the topics in this module can be found in chapter 13 of **Text [2].**

MODULE 4

Theory of Equations 24 Hours

Polynomial Equations - Fundamental Theorem of Algebra (without Proof) - Applications of the fundamental theorem to equations having one or more complex roots, rational roots or multiple roots - Reciprocal equations - Method of finding its roots - Cardano's method for solving cubic equations - Ferrari's Metod for solving quartic equations - Descarte's rule of signs.

The topics in this module can be found in **Text [3].**

More exercises related to the topics in this module can be found in **Reference [4].**

Text

1 **K F Riley, M P Hobson, S J Bence,** *Mathematical Methods for Physics and Engineering*, 3rd Edition, Cambridge University Press.

2 **Mary L Baos**, *Mathematics Methods in the Physical Sciences,* 3rd Edition, Wiley Academic Press.

3 **Bernard and Child** *Higher Algebra*, Macmillan.

References

1 **Erwin Kreyszig**, *Advanced Engineering Mathematics*, 10th Edition, Wiley-India.

2 **David C Lay**, *Linear Algebra and its Applications*, Thomson Publications, 2007.

3 **George B Arfken, Hans J Weber, Frank E Harris,** *Mathematical Methods for Physcists*, 7th Edition.

4 **B. S. Grewal** *Higher Engineering Mathematics 39th Edition*, Khanna Publishers.

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Syllabus for the Complementary course in Mathematics for the First Degree Programme in Chemistry and Industrial Chemistry

UNIVERSITY OF KERALA

Semester IV

MATHEMATICS IV
(Abstract Algebra, Laplace Transforms, Fourier Sries and Differential Equations)
Code: MM1431.7

Instructional hours per week: 5 **No. of Credits: 4**

MODULE 1

Abstract Algebra 24 Hours

Groups - definition and Examples - Elementary properties - Finite Groups and Subgroups - Cyclic Groups - Elementary Properties
Rings - definition and Examples (Finite and Infinite) - Integral Domian and Field - definition and examples (Finite and Infinite)

The topics in this module can be found in **Text [1].**

More exercises related to the topics in this module can be found in **Reference [1].**

MODULE 2

Laplace Transforms and its Applications 24 Hours

Laplace transforms - Elementary Functions - Inverse Transform - Partial Fraction Expansion - Laplace transforms of derivatives - Dirac Delta Function (excluded) - Other Properties - Translation - Derivative of a Transform - Integration of Transforms - Limits of IntegrationUnit Step Function - Convolution (Faltungs) Theorem - Inverse Laplace transforms.
The topics in this module can be found in Chapter 15, sections 15.8 ***to*** 15.12 ***of*** **Text [2].**

More exercises related to the topics in this module can be found in **Reference [2].**

MODULE 3

Fourier Series and Fourier Transforms 18 Hours

Introduction - Simple Harmonic Motion and Wave Motion - Periodic Functions - Applications of Fourier Series - Average Value of a Function - Fourier Coefficients - Dirichlet Conditions - Complex Form of Fourier Series - Other Intervals - Even and Odd Functions - Parsevals Theorem - Fourier Transforms.

The topics in this module can be found in Chapter 7 of **Text [3].**

More exercises related to the topics in this module can be found in Chapter 11 of **Reference [2].**

MODULE 4

Differential Equations 24 Hours

First Order Ordinary Differential Equations - Exact ODEs. Integrating Factors - Linear ODEs - Bernoulli Equation - Orthogonal Trajectories - Homogeneous Linear ODEs with Constant Coefficients - EulerCauchy Equations, Nonhomogeneous ODEs.

The topics in this module can be found in Chapter 1 and 2, sections 1.4, 1.5, 1.6, 2.2, 2.5 ***and*** 2.7 ***of*** **Text [4].**

More exercises related to the topics in this module can be found in Chapter 8 of **Text [3]** and **Reference [2]**

Text

1 **John B Fraleigh** *A first course in Abstract Algebra*, Narosa Publications.

2 **George B Arfken, Hans J Weber, Frank E Harris,** *Mathematical Methods for Physcists*, 7th Edition, Academic Press.

3 **Mary L Baos**, *Mathematics Methods in the Physical Sciences,* 3rd Edition, Wiley

4 **Erwin Kreyszig**, *Advanced Engineering Mathematics*, 10th Edition, Wiley-India.

References

1 **D A R Wallace** *Groups, Rings and Fields*, Springer.

2 **B. S. Grewal** *Higher Engineering Mathematics 39th Edition*, Khanna Publishers.

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Syllabus for the Complementary course in Mathematics for the First Degree Programme in Physics and Computer Application

UNIVERSITY OF KERALA

Semester I

MATHEMATICS I
(Calculus, Infinite Series and Vector Algebra)
Code: MM1131.6

Instructional hours per week: 5 **No. of Credits: 4**

MODULE 1

Differentiation and its Applications 18 Hours

Differentiation (a review) - Leibnitz theorem - Special points of a function - Curvature - Theorems of Differentiation - Mean Value Theorem - Rolle's Theorem.

The topics in this module can be found in Chapter 2, sections 2.1 ***of*** **Text [1].**

More exercises related to the topics in this module can be found in Chapter 2 and Chapter 3 of **Reference [1].**

MODULE 2

Integration and its Apllications 24 Hours

Integration by parts - Reduction formulae - Infinite and Improper Integrals - Plane polar coordinates - Integral inequalities - Applications of Integration (Mean Value of function, Length of Curve, Surface Area of revolution, Volume of revolution.)

The topics in this module can be found in Chapter 2, sections 2.2.8 ***to*** 2.2.13 ***of*** **Text [1].**

More exercises related to the topics in this module can be found in Chapter 4, Chapter 5 and Chapter 7 of **Reference [1].**

MODULE 3

Infinite Series 24 Hours

Summation of series - Arithmetic series - Geometric series - Arithmetico-geometric series - The difference method - Series involving natural numbers - Transformation of series - Convergence of infinite series - Absolute and conditional convergence - Convergence of a series containing only real positive terms - Alternating series test - Operations with series - Power series - Convergence of power series - Operations with power series - Taylor series - Taylors theorem (Proof of these theorems excluded) - Approximation errors in Taylor series - Standard Maclaurin series.

The topics in this module can be found in Chapter 4, sections 4.1 ***to*** 4.6 ***of*** **Text [1].**

More exercises related to the topics in this module can be found in Chapter 9 of **Reference [1]** *and Chapter 1 of* **Reference [2].**

MODULE 4

Vector Algebra 24 Hours

Scalar Triple Product - Vector triple product - Equations of lines, planes and spheres - Using vectors to find distances - Reciprocal vectors

The topics in this module can be found in Chapter 7, sections 7.6 ***to*** 7.9 ***of*** **Text [1].**

More exercises related to the topics in this module can be found in Chapter 11 of **Reference [1]** *and Chapter 6 of* **Reference [2].**

Text

1 **K F Riley, M P Hobson, S J Bence,** *Mathematical Methods for Physics and Engineering*, 3rd Edition, Cambridge University Press.

References

1 **Howard Anton, Irl C. Bivens, Stephen Davis,** *Calculus*, 10th Edition, John Wiley & Sons.

2 **Mary L Baos**, *Mathematics Methods in the Physical Sciences,* 3rd Edition, Wiley.

3 **Erwin Kreyszig**, *Advanced Engineering Mathematics*, 10th Edition, Wiley-India.

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Syllabus for the Complementary course in Mathematics for the First Degree Programme in Physics and Computer Application

UNIVERSITY OF KERALA

Semester II

MATHEMATICS II
(Parial Differentiation, Vector Differentiation, Complex Numbers and Multiple Integrals)
Code: MM1231.6

Instructional hours per week: 5 **No. of Credits: 4**

MODULE 1

Partial Differerentiation 18 Hours

The total differential and total derivative - Exact and inexact differentials - Theorems of partial differentiation - The chain rule - Change of variables - Taylors theorem for many-variable functions - Stationary values of many-variable functions - Stationary values under constraints.

The topics in this module can be found in Chapter 5, sections 5.1 ***to*** 5.9 ***of*** **Text [1].**

More exercises related to the topics in this module can be found in Chapter 13 of **Reference [1].**

MODULE 2

Vector Calculus - Differentiation 24 Hours

Differentiation of vectors -Differentiation of composite vector expressions - Differential of a vector - Integration of vectors - Space curves - Vector functions of several arguments - Surfaces - Scalar and vector fields - Vector operators - Gradient of a scalar field - Divergence of a vector field - Curl of a vector field - Vector operator formulae - Vector operators acting on sums and products - Combinations of grad, div and curl - Cylindrical and spherical polar coordinates - Cylindrical polar coordinates - Spherical polar coordinates.

The topics in this module can be found in Chapter 10, sections 10.1 ***to*** 10.9 ***of*** **Text [1].**

More exercises related to the topics in this module can be found in Chapter 3 of **Reference [3].**

MODULE 3

Complex Numbers 24 Hours

de Moivress Theorem - Trigonometric identities - Finding the nth roots of unity - Solving polynomial equations - Complex logarithms and complex powers - Applications to differentiation and integration - Hyperbolic functions - Inverses of hyperbolic functions - Calculus of hyperbolic functions.

The topics in this module can be found in Chapter 3, sections 3.4 ***to*** 3.7 ***of*** **Text [1].**

More exercises related to the topics in this module can be found in Chapter 6 of **Reference [1]** *and Chapter 13 of* **Reference [4].**

MODULE 4

Multiple Integrals 24 Hours

Double integrals - Triple integrals - Applications of multiple integrals - Areas and volumes only (Masses, centres of mass and centroids - Pappus theorems - Moments of inertia - Mean values of functions are excluded) - Change of variables in multiple integrals - Change of variables in double

integrals- Evaluation of some special infinite integrals - Change of variables in triple integrals - General properties of Jacobians.

The topics in this module can be found in Chapter 6, sections 6.1 ***to*** 6.4 ***of*** **Text [1].**

More exercises related to the topics in this module can be found in Chapter 14 of **Reference [1]** *and Chapter 6 of* **Reference [2].**

Text

1 K F Riley, M P Hobson, S J Bence, *Mathematical Methods for Physics and Engineering*, 3rd Edition, Cambridge University Press.

References

1 Howard Anton, Irl C. Bivens, Stephen Davis, *Calculus*, 10th Edition, John Wiley & Sons.

2 Mary L Baos, *Mathematics Methods in the Physical Sciences,* 3rd Edition, Wiley.

3 George B Arfken, Hans J Weber, Frank E Harris, *Mathematical Methods for Physcists*, 7th Edition, Academic Press.

4 Erwin Kreyszig, *Advanced Engineering Mathematics*, 10th Edition, Wiley-India.

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Syllabus for the Complementary course in Mathematics for the First Degree Programme in Physics and Computer Application

UNIVERSITY OF KERALA

Semester III

MATHEMATICS III
(Theory of Matrices, Vector Integration, Differential Equations and Fourier Series)
Code: MM1331.6

Instructional hours per week: 5 **No. of Credits: 4**

MODULE 1

Theory of Matrices 24 Hours

Matrices and row reduction - Determinants - Cramers Rule for solving system of equations - Vectors - Lines and Planes - Linear Combinations - Linear Functions - Linear Operators - Linear Dependence and Independence - Special Matrices like Hermitian matrices and Formulas - Linear Vector Spaces - Eigenvalues and Eigenvectors - Diagonalizing Matrices - Applications of Diagonalization.

The topics in this module can be found in Chapter 3 of **Text [2].**

More exercises related to the topics in this module can be found in Chapter 7 and 8 of **Text [3].** *This topics can be referred in* **Reference [4].**

MODULE 2

Vector Calculus - Integration 24 Hours

Evaluating Line integrals - Physical examples of line integrals - Line integrals with respect to a scalar - Connectivity of regions - Greens theorem in a plane - Conservative fields and potentials - Surface integrals - Evaluating surface integrals - Vector areas of surfaces - Physical examples of surface integrals - Volume integrals - Volumes of three-dimensional regions - Integral forms for grad, div and curl - Greens theorems (without proof) - Other related integral theorems - Physical applications of the divergence theorem - Stokes theorem and related theorems (without proof) - Related integral theorems - Physical Applications.

The topics in this module can be found in Chapter 11 of **Text [1].**

More exercises related to the topics in this module can be found in Chapter 3 of **Text [2].**

MODULE 3

Differential Equations 24 Hours

First Order Ordinary Differential Equations - Exact ODEs. Integrating Factors - Linear ODEs - Bernoulli Equation - Orthogonal Trajectories - Homogeneous Linear ODEs with Constant Coefficients - EulerCauchy Equations, Nonhomogeneous ODEs.

The topics in this module can be found in Chapter 1 and 2, sections 1.4*,* 1.5*,* 1.6*,* 2.2*,* 2.5 ***and*** 2.7 ***of*** **Text [3].**

More exercises related to the topics in this module can be found in Chapter 8 of **Text [2]** and **Reference [2]**

MODULE 4

Fourier Series and Fourier Transforms 18 Hours

Introduction - Simple Harmonic Motion and Wave Motion - Periodic Functions - Applications of Fourier Series - Average Value of a Function - Fourier Coefficients - Dirichlet Conditions - Complex Form of Fourier Series - Other Intervals - Even and Odd Functions - Parsevals Theorem - Fourier Transforms.

The topics in this module can be found in Chapter 7 of **Text [2].**

More exercises related to the topics in this module can be found in Chapter 11 of **Text [3].**

Text

1 **K F Riley, M P Hobson, S J Bence,** *Mathematical Methods for Physics and Engineering*, 3rd Edition, Cambridge University Press.

2 **Mary L Baos**, *Mathematics Methods in the Physical Sciences,* 3rd Edition, Wiley.

3 **Erwin Kreyszig**, *Advanced Engineering Mathematics*, 10th Edition, Wiley-India.

References

1 **Howard Anton, Irl C. Bivens, Stephen Davis,** *Calculus*, 10th Edition, John Wiley & Sons.

2 **B. S. Grewal** *Higher Engineering Mathematics 39th Edition*, Khanna Publishers.

3 **George B Arfken, Hans J Weber, Frank E Harris,** *Mathematical Methods for Physcists*, 7th Edition, Academic Press.

4 **David C Lay**, *Linear Algebra and its Applications*, Thomson Publications, 2007.

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Syllabus for the Complementary course in Mathematics for the First Degree Programme in Physics and Computer Application

UNIVERSITY OF KERALA

Semester IV

MATHEMATICS IV
(Abstract Algebra, Laplace Transforms, Special Functions and Functions of A Complex Variable)
Code: MM1431.6

Instructional hours per week: 5 **No. of Credits: 4**

MODULE 1

Abstract Algebra 24 Hours

Groups - definition and Examples - Elementary properties - Finite Groups and Subgroups - Cyclic Groups - Elementary Properties
Rings - definition and Examples (Finite and Infinite) - Integral Domian and Field - definition and examples (Finite and Infinite)

The topics in this module can be found in **Text [1].**

More exercises related to the topics in this module can be found in **Reference [1].**

MODULE 2

Laplace Transforms and its Applications 24 Hours

Laplace transforms - Elementary Functions - Inverse Transform - Partial Fraction Expansion - Laplace transforms of derivatives - Dirac Delta Function (excluded) - Other Properties - Translation - Derivative of a Transform - Integration of Transforms - Limits of IntegrationUnit Step Function - Convolution (Faltungs) Theorem - Inverse Laplace transforms.
The topics in this module can be found in Chapter 15, sections 15.8 ***to*** 15.12 ***of*** **Text [2].**

More exercises related to the topics in this module can be found in **Reference [2].**

MODULE 3

Special Functions 18 Hours

The Factorial Function - Definition of the Gamma Function - Recursion Relation - The Gamma Function of Negative Numbers - Some Important Formulas Involving Gamma Functions - Beta Functions - Beta Functions in Terms of Gamma Functions.

The topics in this module can be found in Chapter 11 of **Text [3].**

More exercises related to the topics in this module can be found in chapter 13 of **Text [2].**

MODULE 4

Fuunctions of A Complex Variable 24 Hours

Functions of a complex variable - Analytic Functions - Cauchy-Riemann Relations - Contour Integrals - Cauchy's Theorem - Cauchy's Integral Formula - Laurent Series - The Residue Theorem - Methods of Finding Residues - Evaluation of Definite Integrals by Use of the Residue Theorem - Residues at Infinity.

The topics in this module can be found in Chapter 14, sections 1 ***to*** 8 ***of*** **Text [3].**

More exercises related to the topics in this module can be found in Chapter 14, 15 and 16 of **Reference [2]**

Text

1 John B Fraleigh *A first course in Abstract Algebra*, Narosa Publications.

2 George B Arfken, Hans J Weber, Frank E Harris, *Mathematical Methods for Physcists*, 7th Edition,

3 Mary L Baos, *Mathematics Methods in the Physical Sciences,* 3rd Edition, Wiley Academic Press.

References

1 D A R Wallace *Groups, Rings and Fields*, Springer.

2 Erwin Kreyszig, *Advanced Engineering Mathematics*, 10th Edition, Wiley-India.

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Syllabus for the Complementary course in Mathematics for the First Degree Programme in Computer Science

UNIVERSITY OF KERALA

Semester I

MATHEMATICS I
Calculus and Number Theory
Code: MM1131.10

Instructional hours per week: 4 **No. of Credits: 3**

MODULE 1

Differerentiation and its Applications 18 Hours

Differentiation: Hyperbolic and inverse hyperbolic functions.
Applications: nth - derivative of - polynomials, exponential, sine, cosine and their product, Leibnitz Theorem (Without Proof) and its application

The topics in this module can be found in Chapter 6, sections 6.7 ***and*** 6.8 ***of Text [1] and Chapter 4, sections*** 4.1 ***and*** 4.2 ***of Text [2].***

MODULE 2

Integration and its Apllications 18 Hours

Definite and Indefinite Integrals: Integration techniques - substitution, rational functions with degree of numerator less than and greater than or equal to the degree of denominator, partial fraction and integration by parts.
Applications: Area of a curve, area between two curves, length of a plane curve, area of a surface of revolution and volume of revolution. (volume by cylindrical shells, volume by slicing are excluded)

The topics in this module can be found in Chapter 4, sections 4.1***,*** 4.2***,*** 4.3 ***and*** 4.5 ***and Chapter 5, sections*** 5.1***,*** 5.4 ***and*** 5.5 ***of Text [1].***

MODULE 3

Ordinary Differential Equations 18 Hours

Ordinary Differential Equations: Solution of Higher Order differential equations with constant coefficients (homogeneous and non-homogeneous - exponential, sine, cosine and hyperbolic functions and their combinations), solution of first and second order simultaneous system of equations, Cauchy-Euler type differential equations, Legendre's differential equations.

The topics in this module can be found in Chapter 5, sections 5.2***,*** 5.3***,*** 5.7 ***and*** 5.8 ***and Chapter 7, section*** 7.2 ***of Text [3].***

MODULE 4

Number Theory 18 Hours

Numbers: Euclid's Algorithom - GCD of 2 natural numbers, Divisors of a given natural number, Highest power of a prime.
Congruences: Euler's function $\phi(n)$ and its properties(without proof of theorems), Fermat's and Wilson's Theorems, Euler's extension of Fermat's theorem(Only Statements) and its applications to find the remainder when divisible by a given number.

The topics in this module can be found in Chapter 3, sections A ***and*** B ***and Chapter 9, sections*** B ***and*** C ***of Text [4].***

Text

1. **Howard Anton, Irl C. Bivens, Stephen Davis,** *Calculus*, 10th Edition, John Wiley & Sons.
2. **B. S. Grewal**, *Higher Engineering Mathematics*, 42th Edition, Khanna Publishers.
3. **Zafar Ahsan**, *Differential Equations and Their Applications*, Second Edition, Prentice Hall of India.
4. **Lindsey N Childs**, *A concrete Indroduction to Higher Algebra*, Second Edition, Springer.

References

1. **Erwin Kreyszig**, *Advanced Engineering Mathematics*, 10th Edition, Wiley-India.
2. **S Barnard and J M Child**, *Higher Algebra*, Enlarged Edition, Macmillan And Company Limited.

REMARK

***** Excercise and problems should be solved and graphed using a Computer Algebra System (CAS).

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Syllabus for the Complementary course in Mathematics for the First Degree programme in Computer Science

UNIVERSITY OF KERALA

Semester II

MATHEMATICS II
Discrete Mathematics
Code: MM1231.10

Instructional hours per week: 4 **No. of Credits: 3**

MODULE 1

Mathematical Logic 18 Hours

Proposition and Connectives : Conditional and Biconditional Equivalence of Propositions, Tautology and Contradictions, Duality Theorem and its properties, Algebra of Proposition.
Normal Form: Principal Disjunctive, Principal Conjunctive Normal Forms and its applications using with and without truth tables
Theory of Inference: Rules of Inference - Rule P, Rule T and Rule CP, Consistant and Inconsistant premises, Indirect Method of Proof using these inference rules.

The topics in this module can be found in Chapter 1 of Text [1].

MODULE 2

Predicate Logic 18 Hours

Quantifiers: Essential and Universal quantifier, Free and Bound Variables.
Rules of Specifications: Rule US, ES, UG, EG. Using these, convert a given statement into symbolic notation. Derivation from Premises using truth table and without using truth table.

The topics in this module can be found in the continuation of Chapter 1 of Text [1].

MODULE 3

Set Theory 18 Hours

Partition of Set: POSET - HASSE diagrams for partial ordering - lub, glb.
Lattices: Definiion and Examples, principle of duality, Properties - Idem Potency, commutatively, associativity, absorption(sub lattices excluded).
Group Theory: Definition, Examples, Order of a Group and its elements.
The topics in this module can be found in Chapter 2 and Chapter 5 of Text [1].

MODULE 4

Coding Theory and Combinatorics 18 Hours

Coding Theory: Group Code, Encoders and Decoders, Hamming Codes - Hamming distance, decoding and encoding function - correction and detection of errors in Group Codes - parity check matrix and its properties.
Combinatorics: Recurrence relations of degree k with constant coefficients (Homogeneous and Nonhomogeneous) and its solutions (Nonhomogeneeous including Polynomial, Trigonometric $sin(ax)$ or $cos(ax)$ exponential - excluding their product combinations)- Generating function Method of is also included.

The topics in this module can be found in Chapter 6 of Text [1].

Text

1. **T Veerarajan,** *Discrete Mathematics with Graph Theory and Combinatorics*, Tata McGraw-Hill, New Delhi, 2007.

References

1. **Seymour Lipschutz, Marc Lars Lipson**, *Discrete Mathematics*, Schaum's Solved Problems Series, McGraw-Hill International Editions.

2. **Ralph P Grimaldi, B V Ramana**, *Discrete and Combinatorial Mathematics*, 5th Edition, Pearson Education.

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