St. Albert's College (Autonomous)

DESCRIPTIVE STATISTICS

I. Course Instructor

Name	Sem, Programme& Batch	Email
Ms. Amritha K Madhav	Sem 1 BSc ,2018-19	amrithakmadhav555@gmail.com

II. Duration of Course:

No	Activity	Duration
1	Contact hours	69(Including assignments)
2	Assessment (CAE & ESE)	6
	Total	75
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	6

III. Course Objectives:

- Give an insight to the students in the area of different type of data and its collection.
- To give the concepts of statistical population and sample.
- Describe and explain data graphics- box plot and ogives.
- Describe central tendency, dispersion, skewness and kurtosis.
- Give an idea about the concept of Index numbers.

IV. Course Delivery Plan

This course is a course requiring lot of student centric learning processes. The teaching methods include lectures, discussions etc.

Topics **These are the topics to be covered in the modules**	**Session No & Date(s)**	**Methodology and Duration**
Statistics as collected facts and figures and science for extracting information from data Concepts of a statistical population and sample. Different types of characteristics and data- qualitative and quantitative, cross sectional and time series, discrete and continuous, frequency and non frequency. Different types of scale- nominal and ordinal, ratio and interval Collection of data- census and sampling. Different types of random samples- simple random sample, systematic, stratified and cluster(description only) Primary and secondary data, schedule and questionnaire. Data collection by different methods- direct, using third parties, sending questionnaire, by mail/telephone	20/06/2018 to 17/07/2018	Class exercises Lectures Illustrations with examples.
Classification and tabulation- one way and two way classified data. Preparation of frequency distribution, Relative frequency and cumulative frequency distributions, Stem and leaf chart, line diagram, bar diagram, pie diagram, histogram, frequency polygon, frequency curve and ogive. Averages- AM, Median, Mode, GM, HM, and weighted averages. Quantiles- quartiles, deciles, percentiles. (Problems based on above topics)	18/07/2018 to 14/08/2018	Lectures Class Exercises
Measures of absolute dispersion- Range, quartile deviation, mean deviation and standard deviation. Box plot, relative measures, C.V Raw moments, Central moments and their inter relation. Combined mean and standard deviation Skewness- Pearson's, Bowley's and moment measures of skewness. Kurtosis- percentile and moment measure of kurtosis. (Problems based on above topics)	29/08/2018 to 27/09/2018	Class Exercises Lectures Discussions

Definition of index numbers. Price index numbers. Price index numbers as Simple (AM, GM) and weighted averages (AM) of price relatives. Laspayer's, Paasche's and Fishers index number. Time reversal and factor reversal test Cost of living index numbers family budget and aggregate expenditure methods. An introduction to whole sale price index and consumer price index.	28/09/2018 to 26/10/2018	Discussions Lectures Exercises

V. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time
Visualization of basic concepts	1 Hour	Experiential Learning	1st Week
Illustration of graphs and tables	5 Hours	Experiential learning	3rd Week

VI. Assignments and Seminars

Assignments

The following Assignment needs to be submitted to Google Classroom. Both the assignments & presentation are individual assignments.

No	Topics	Activity	Submission Deadlines	
Assignment 1	Assignment on given topic	Preparation of assignment	20th July 2018	Submit the assignment before 27th July 2018
Assignment 2	Assignment on given topic	Preparation of assignment	24th September 2018	Submit the assignment before 1st October 2018.

Note: Failure to upload the assignment on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.

Page PAGE * MERGEFORMAT 3

VII. Attendance (one component in class participation):

95-100%	5
90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	**Not eligible for appearing for ESE**

St. Albert's College Ernakulam-682018

VIII. Required reading:

1. Goon, A. M.,Gupta M. K. and Dasgupta,B(1986).Fundamentals of Statistics,Volume1, world press, Kolkota

2. Gupta, S. C. and Kapoor, V. K.(2002). Fundamentals of Mathematical Statistics, 11th edition, Sultan Chand and Sons.

3. R.S.N. Pillai, Bagavathi(2010). STATISTICS- Theory and Practice, S.Chand publications.

4. Medhi J.(2006). Statistical Methods, 2nd edition, New Age International Publishes.

5. Miller, I. and Miller, M.(2014). Mathematical Statistics, 8th edition, Pearson Education Inc..

St. Albert's College (Autonomous), Ernakulam

MAT1CMT0117: PARTIAL DIFFERENTIATION, MATRICES, TRIGONOMETRY AND NUMERICAL METHODS

Course Instructor

Name	Sem, Programme& Batch	Email
Golda Mary Joseph, Divya Mary Daise S, Anju M.M, Mary Alphonsa	Sem 1, B.Sc(Complementary), 2018-2019	goldamary@alberts.edu.in, divyamary@alberts.edu.in, anjumm@alberts.edu.in maryalphonsa@alberts.edu.in

I. Duration of Course:

No	Activity	Duration
1	Contact hours	72(Including assignments)
2	Assessment (CAE & ESE)	6
	Total	**78**
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	**6**

II. Course Objectives:

- calculate partial derivatives of functions of several variables.
- calculate the rank of a matrix.
- compute summation of infinite series.
- solve system of equations using matrix method.
- determine the characteristic roots and characteristic vectors of a Matrix.
- analyse various numerical methods
- find roots of equations by numerical methods

III. Course Delivery Plan

This course is a course requiring lot of student centric learning processes. The teaching methods include lectures, discussions, assignments, etc.

St. Albert's College Ernakulam-682018

Topics	Session No & Date(s)	Methodology and Duration
These are the topics to be covered in the modules		
Partial Differentiation: Functions of several variables (Definitions and simple graphs only), Partial derivatives, The Chain Rule.	20/06/2018 to 13/07/2018	Class exercises Lectures Discussions
Matrices: Rank of a Matrix, Elementary transformations of a matrix, Reduction to Normal form, Employment of only row (column) transformations, System of Linear Homogeneous Equations, Systems of linear non homogenous equations, Characteristic roots and characteristic vectors of a square matrix, Characteristic matrix and Characteristic equation of a matrix, Cayley-Hamilton theorem, Expression of the inverse of a nonsingular matrix A as a polynomial in A with scalar coefficients	16/07/2018 to 14/08/2018	Lectures, Discussions, Class exercises
Trigonometry: Expansions of sin nθ, cosnθ, tan nθ, and hyperbolic functions, inverse circular and hyperbolic function, Separation into real and imaginary parts, Summation of infinite series based on C + i S method	29/08/ 2018 to 29/09/2018	Lectures, Class exercises,
Numerical Methods: Bisection Method, Method of False position, Iteration Method, Newton - Raphson Method.	01/10/2018 to 26/10/2018	Lectures, Class exercises

II. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time
Google search and know more about the ' circular and hyperbolic functions'	1 Hour	Self-Learning	1st Week of September
Illustration of the examples of problems in Numerical methods	5 Hours	Experiential learning	1st Week of October

III. Assignments and Seminars

Assignments

No	Topics	Activity	Submission Deadlines	
Assignment 1	Assignment on given topic	Preparation of assignment	16 th July 2018	Submit the assignment before 23th July 2018
Assignment 2	Assignment on the given topic	Preparation of assignment	13th August 2018	Submit the assignment before 30 th August 2018

Note: Failure to submit the assignment on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.

St. Albert's College
Ernakulam-682018

IV. Attendance (one component in class participation):

90-100%	5
85-89%	4
80-84%	3
76-79%	2
<75	**1-Not eligible for appearing for ESE**

V. Required reading:

1. **George B. Thomas, Jr: Thomas'Calculus12thEdition, Pearson.**
2. **Shanthi Narayanan& P.K. Mittal, A Text Book of Matrices, S. Chand.**
3. **S. L.Loney–Plane Trigonometry Part–II, AITBS Publishers India, 2009.**
4. **S. S. Sastry, Introductory methods of Numerical Analysis, 4th Edition (PrenticeHall)**

St. Albert's College (Autonomous)

MM1CRT0117 FOUNDATION OF MATHEMATICS

Course Instructor

Name	Sem, Programme& Batch	Email
Divya Mary Daise S, Jini Johny	Sem 1 BSc ,2018-19	divyamary@alberts.edu.in, jinijohny@alberts.edu.in

I. Duration of Course:

No	Activity	Duration
1	Contact hours	72(Including assignments)
2	Assessment (CAE & ESE)	6
	Total	**78**
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	**6**

II.Course Objectives:

- to explain the fundamental ideas of sets and functions
- to introduce basic logic
- to introduce basic Theory of Equations

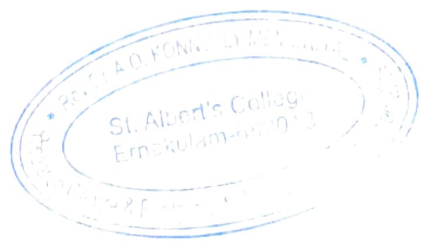
III. Course Delivery Plan

The teaching methods include lectures, discussions, assignments, Seminars etc.

Topics	Session No & Date(s)	Methodology and Duration
These are the topics to be covered in the modules		
Basic logic: Propositional logic , Propositional equivalences, Predicates and quantifiers nested quantifiers, Rules of inference , Introduction to poofs	20/06/2018 TO 20/07/2018	Lectures, Discussions, Class exercises
Set theory: Sets,set operations,functions	23/07/2018 TO 10/08/2018	Lectures, Discussions, Class exercises
Relations: Relations and their properties, representing relations and equivalence relations, partial orderings	13/08/ 2018 TO 19/09/2018	Lectures, Class exercises,
Theory of equations: Roots of equations, Relations connecting the roots and coefficients of an equation, transformation of equations, Special cases,The cubic equation, The biquadratic equation, Character and the position of the roots of an equation, Some general theorems, Descartes's Rule of signs, Corollaries, Reciprocal equations	24/9/2018 TO 26/10/2018	Lectures, Class exercises

II. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time
Drawing graphs of functions and	3 Hour	Experiential Learning	2nd Week



understanding functions easily			
Illustrations with real life examples of concepts	3 Hours	Experiential learning	3rd Week

III. Assignments and Seminars

Assignments

No	Topics	Activity	Submission Deadlines	
Assignment 1	Assignment on given topic	Preparation of assignment	2nd July, 2018	Submit the assignment before 13th July, 2018
Assignment 2	Assignment on given topic	Preparation of assignment	1st August, 2018	Submit the assignment before 13th August, 2018

Note: Failure to submit the assignment on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.

IV. Attendance (one component in class participation):

>90%	A
85-90%	B
80-85%	C
75-80%	D
<75	**E- Not eligible for appearing for ESE**

V. Required reading:

1. Lipschutz: Set Theory and related topics (Second Edition), Schaum Outline Series, Tata McGraw-Hill Publishing Company, New Delhi.
2. Graham Everest, Thomas Ward: An Introduction to Number Theory, , Springer

St. Albert's College (Autonomous), Ernakulam

MAT2CMT0117: INTEGRAL CALCULUS AND DIFFERENTIAL EQUATIONS

Course Instructor

Name	Sem, Programme& Batch	Email
Golda Mary Joseph, Divya Mary Daise S, Anju M.M	Sem 2, B.Sc(Complementary), 2018- 2019	goldamary@alberts.edu.in , divyamary@alberts.edu.in anjumm@alberts.edu.in

I. Duration of Course:

No	Activity	Duration
1	Contact hours	72(Including assignments)
2	Assessment (CAE & ESE)	6
	Total	**78**
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	**6**

II.Course Objectives:

- Find the area under a given curve, length of an arc of a curve when the equations are given in parametric and polar form.
- Find the area and volume by applying the techniques of double and triple integrals
- Obtain an integrating factor which may reduce a given differential equation into an exact one and eventually provide its solution.
- Describe the origin of partial differential equation and distinguish the integrals of first order linear partial differential equation into complete, general and singular integrals.
- Use Lagrange's method for solving the first order linear partial differential equation

III. Course Delivery Plan

This course is a course requiring lot of student centric learning processes. The teaching methods include lectures, discussions, assignments, etc.

Topics

These are the topics to be covered in the modules	Session No & Date(s)	Methodology and Duration
Integral Calculus: Volumes using Cross-Sections, Volumes using Cylindrical shells, Arc lengths, Areas of surfaces of Revolution.	26/11/2018 to 14/12/2018	Class Exercises, Lectures, Discussions, Illustrations with examples
Multiple Integrals : Double and iterated integrals over rectangles, Double integrals over general regions, Area by double integration, Triple integrals in rectangular co-ordinates.	17/12/2018 to 17/01/2019	Lectures, Discussions, Class exercises
Ordinary Differential Equations : Separable Variables, Exact Differential Equation, Equations reducible to exact form, Linear Equations, Solutions by Substitutions, Homogeneous equations and Bernoulli's Equations.	18/01/2019 to 14/12/2019	Lectures, Class exercises
Partial Differential Equations : Surfaces and Curves in three dimensions, Solution of equations of the form $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$. Origin of first order and second order partial differential equations, Linear equations of the first order, Lagrange's method.	08/02/2018 to 09/03/2018	Lectures, Class exercises

St. Albert's College
Ernakulam

II. Innovative Learning Programmes

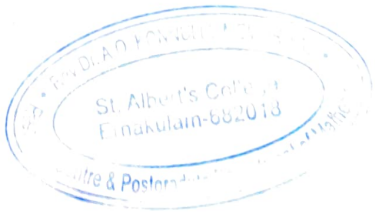
Name of Programme	Duration	Type	Proposed Time
Google search and know about the origin of partial differential equations	1 hour	Self-Learning	2nd week of February
Illustration of the examples for finding the volume	5 Hours	Experiential learning	1 st week of December

III. Assignments and Seminars

Assignments

No	Topics	Activity	Submission Deadlines	
Assignment 1	Assignment on given topic	Preparation of assignment	08/12/2017	Submit the assignment before the due date
Assignment 2	Assignment on the given topic	Preparation of assignment	12/01/2018	Submit the assignment before the due date
Assignment 3	Assignment on the given topic	Preparation of assignment	09/02/2018	Submit the assignment before the due date

Note: Failure to submit the assignment on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.



IV. Attendance (one component in class participation):

90-100%	5
85-89%	4
80-84%	3
76-79%	2
<75	**Not eligible for appearing for ESE**

V. Required reading:

1. George B. Thomas, Jr.: Thomas' Calculus 12th Edition,(Pearson).
2. A. H. Siddiqi, P. Manchanada : A first Course in Differential Equations with Applications (Macmillan India Ltd 2006)
3. Ian Sneddon : Elements of Partial Differential Equations (Tata Mc Graw Hill)
4. Shanti Narayan, P. K. Mittal: Integral Calculus (S. Chand & Company)
5. Differential Equations, E. Rukmangadachari, Pearson.
6. R. K. Ghosh, K. C. Maity – An introduction to Differential Equations, New Central Books.

St. Albert's College (Autonomous)

PROBABILITY THEORY

I. Course Instructor

Name	Sem, Programme& Batch	Email
Ms. Amritha K Madhav	Sem 2 BSc ,2018-19	amrithakmadhav555@gmail.com

II. Duration of Course:

No	Activity	Duration
1	Contact hours	72(Including assignments)
2	Assessment (CAE & ESE)	6
	Total	78
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	6

III. Course Objectives:

- Give a basic idea about probability and its important properties
- To describes about random variables and its properties
- To explain about bivariate random variables
- To introduce the concepts of correlation and regression
- Enable students to fit a curve, identify the regression equations etc
- Give the cognizance of scatter plot, Karl Pearson's correlation coefficient, Spearman rank correlation coefficient etc.

IV. Course Delivery Plan

This course is a course requiring lot of student centric learning processes. The teaching methods include lectures, discussions, field based assignments etc.

Topics	Session No & Date(s)	Methodology and Duration
Topics	Session No & Date(s)	Methodology and Duration
These are the topics to be covered in the modules		

St. Albert's College Ernakulam-682018

Random experiments, complements, union and intersection of events and their meaning Mutually exclusive, equally likely and independent events. Classical, frequency and axiomatic approach of probability. Monotone property, addition theorem (up to 3 events), Boole's inequality (finite case), and other simple properties. Conditional probability, multiplication theorem (up to 3 events), independence of events, total probability law, Baye's theorem (problems based on above topics)	26/11/2018 to 04/01/2019	Class exercises Lectures Discussions
Concepts of random variables- discrete and continuous random variables. Probability mass and density functions, and cumulative distribution functions. Evaluation of conditional and unconditional probabilities. Relation of pmf/pdf with relative frequency, and cdf with less than cumulative frequency distribution. Change of variables- methods of jacobian and cumulative distribution function (one variable case). Probability integral transformation. (Problems based on above topics)	07/01/2019 to 15/02/2019	Discussions Lectures Class Exercises
Concept of two component random vector. Bivariate probability mass and density functions. Marginal and conditional distributions. Independence of bivariate random variables (Problems based on above topics)	18/02/2019 to 08/03/2019	Discussions Lectures Class Exercises
Bivariate data, types of correlation. Scatter diagram. Karl Pearson's product-moment and Spearman's rank correlation coefficients. Computation of correlation coefficient from two-way tables. Coefficient of determination. Regression equations- fitting polynomial equations of degree one and two; exponential curve, power curve (problems based on above topics)	11/03/2019 to 02/04/2019	Discussions Lectures Class Exercises

V. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time
Illustration of basic concepts of probability theory	4 Days	Experiential Learning	1st Week
Illustrations with examples of theorems and concepts	5 Hours	Experiential learning	2nd Week

VI. Assignments and Seminars

Assignments

The following Assignment needs to be submitted to Google Classroom. Both the assignments & presentation are individual assignments.

No	Topics	Activity	Submission Deadlines	
Assignment 1	Assignment on given topic	Preparation of assignment	12th December 2018	Submit the assignment before 20th December 2018
Assignment 2	Assignment on given topic	Preparation of assignment	4th February 2019	Submit the assignment before 11th February 2019

Note: Failure to upload the assignment on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.

VII. Attendance (one component in class participation):

95-100%	5
90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	Not eligible for appearing for ESE

VIII. Required reading:

1. Gupta S. C. and Kapoor V. K.(2002). Fundamentals of Mathematical Statistics, 11th edition, Sultan Chand and Sons.

2. Hogg R. V., Mckean J. W., and Craig A. T.(2014) Introduction to Mathematical Statistics,

6th edition, Pearson Education Inc.

3. R.S.N. Pillai, Bagavathi(2010). STATISTICS- Theory and Practice, S.Chand publications.

4. Medhi J.(2006). Statistical Methods, 2nd edition, New Age International Publishes.

5. Miller, I. and Miller, M.(2014). Mathematical Statistics, 8th edition, Pearson Education Inc..

6. Mood, A. M., Graybill, F.A. and Bose, F.A.(1974).Introduction to Theory of Statistics,

Oxford and IBH publishers.

7. Ross, S.(2003). A first comes in probability Pearson, Education Publishers, Delhi.

St. Albert's College (Autonomous)

MAT2CRT0117 ANALYTIC GEOMETRY, TRIGONOMETRY AND DIFFERENTIAL CALCULUS

Course Instructor

Name	Sem, Programme & Batch	Email
Divya Mary Daise S	Sem 2 BSc ,2018-19	divyamary@alberts.edu.in

I. Duration of Course:

No	Activity	Duration
1	Contact hours	72(Including assignments)
2	Assessment (CAE & ESE)	6
	Total	**78**
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	**6**

II.Course Objectives:

- Introduce more ideas of conics;
- Introduce Circular and hyperbolic functions of a complex variable:

III. Course Delivery Plan

The teaching methods include lectures, discussions, assignments, etc.

St. Albert's College
Ernakulam-682018

Topics	Session No & Date(s)	Methodology and Duration
These are the topics to be covered in the modules		
Conic sections:Tangents and Normals (cartesian and parametric form) of a conic, Orthoptic locus. Pole and Polar. Chord in terms of given points. Conjugate diameters of ellipse.	26/11/2018 TO 14/12/2018	Lectures, Discussions, Class exercises
Polar co-ordinates, polar equation of a line, polar equation of a circle and polar equation of a conic. Polar equations of tangent and normals,Chords of conic sections.	17/12/2018 TO 18/01/2019	Lectures, Discussions, Class exercises
Trigonometry:Circular and hyperbolic functions of a complex variable. Separation into real and imaginary parts. Factorisation . Summation of infinite series by C + i S method	21/01/ 2019 TO 15/02/2019	Lectures, Class exercises,
Differential Calculus: Successive differentiation and indeterminate forms	18/2/2019 TO 27/3/2019	Lectures, Class exercises

II. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time
Visual understanding of conics and related topics	3 Hour	Experiential Learning	2nd Week
Visual understanding of trignometric and hyperbolic ratios	3 Hours	Experiential learning	9th Week

III. Assignments and Seminars

Assignments

No	Topics	Activity	Submission Deadlines

Assignment 1	Assignment on given topic	Preparation of assignment	3rd December, 2018	Submit the assignment before 14th December, 2018
Assignment 2	Assignment on given topic	Preparation of assignment	1st January , 2019	Submit the assignment before 11th January , 2019

Note: Failure to submit the assignment on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.

IV. Attendance (one component in class participation):

>90%	A
85-90%	B
80-85%	C
75-80%	D
<75	**E- Not eligible for appearing for ESE**

V. Required reading:

1. S.K . Stein – Calculus and analytic Geometry , (McGraw Hill)
2. P.K. Jain , Khalil Ahmed : Analytic geometry of two dimensions (2nd edition), New Age International Limited Publishers
3. Thomas and Finney : Calculus and analytic Geometry , Addison Wesley.

St. Albert's College (Autonomous)

PROBABILITY DISTRIBUTIONS

Course Instructor Name	Sem, Programme& Batch	Email
Ms. Amrita K Madhav	Sem 3 BSc, 2018-19	

1. Duration of Course:

No	Activity	Duration
1	Contact hours	68 (Including assignments)
2	Assessment (CAE & ESE)	6
	Total	**74**
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	**6**

II.Course Objectives:

- The basic concepts like random variables and its expectation, mgf and characteristic functions.
- Understand Chebychev's inequality, Weak Law of Large Numbers- Bernoulli's and Chebychev's form and Central Limit Theorem
- Standard probability distributions like Uniform (discrete/continuous), Bernoulli, binomial, Poisson, geometric, hyper-geometric, exponential, gamma- one and two parameter(s), beta(type I and type II) and Normal distribution with all properties.
- Understand sampling distributions Chi-square, t, F distributions.

III. Course Delivery Plan

This course is a course requiring lots of student centric learning processes. The teaching methods include lectures, discussions, assignments, Seminars etc.

Topics	Session No & Date(s)	Methodology and Duration
These are the topics to be covered in the modules		
Expectation of random variables and their functions. Definition of - Raw moments, central moments and their interrelation, A.M, G.M, H.M, S.D, M.D., covariance, Pearson's correlation coefficient in terms of expectation.MGF and characteristic function and simple properties. Moments from mgf. (Problems based on these topics)	06/06/2018 TO 29/06/2018	Class exercises Lectures Discussions Illustration with examples
Uniform(discrete/continuous), Bernoulli, binomial, Poisson, geometric, hyper-geometric, exponential, gamma- one and two parameter(s),beta(type I and type II),- mean, variance, mgf, additive property, lack of memory property. Normal distribution with all properties.(Problems based on these topics).	02/07/2018 TO 30/07/2018	Lectures, Discussions, Class exercises
Chebychev's inequality, Weak Law of Large Numbers- Bernoulli's and Chebychev's form. Central Limit Theorem(Lindberg- Levy form with proof).(Problems based on these topics).	01/08/ 2018 TO 31/08/2018	GD, Lectures, Class exercises, Presentations by students
Concept of sampling from a probability distribution .i.i.d. observations. Concept of sampling distributions, Statistic(s) and standard error(s). Mean and variance of sample mean when sampling is from a finite population. Sampling distribution of mean and variance from normal distribution. Chi-square, t, F distributions and statistics following these distributions. Relation among Normal, Chi-square, t and F distributions.(Problems based on these topics)	03/09/2018 TO 19/09/2018	GD, Lectures, Class exercises

2. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time
Visualisation of different research methods using videos	1 Hour	Experiential Learning	1st Week

St. Albert's College
Ernakulam-682018

Illustrations with examples of theorems and concepts	5 Hours		Experiential learning	2nd Week

3. Assignments and Seminars

Assignments

No	Topics	Activity	Submission Deadlines	
Assignment	Assignment on given topic	Preparation of assignment	29th July 2018	Submit the assignment to Google Classroom before 11.59 pm
Seminar	PowerPoint presentation on given topic	PowerPoint Presentation for a presentation of 30 minutes duration	**01/08/2018 to 10/08/2018**	Submit the report before 15th August

Note: Failure to submit the assignment on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.

4. Attendance (one component in class participation):

90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	**Not eligible for appearing for ESE**

5. Required reading:

1. Goon A. M., Gupta M. K., and Dasgupta B.(2005). Fundamentals of Statistics, Vol.II, 8th edition, World Press, Kolkatta.
2. Gupta S. C. and Kapoor V. K.(2002). Fundamentals of Mathematical Statistics, 11th edition, Sultan Chand and Sons.
3. Hogg R. V., Mckean J. W., and Craig A. T.(2014). Introduction to MathematicalStatistics, 6th edition, Pearson Education Inc.

St. Albert's College (Autonomous), Ernakulam

MAT3CMT011: Vector Calculus , Analytic Geometry and Abstract Algebra

Course Instructor

Name	Sem, Programme& Batch	Email
Anju M.M, Jini Johny C.J, Mary Alphonsa	Sem 3 B.Sc(Complementary), 2018-2019	anjumm@alberts.edu.in, jinijohny@alberts.edu.in, maryalphonsa@alberts.edu.in

I. Duration of Course:

No	Activity	Duration
1	Contact hours	90(Including assignments)
2	Assessment (CAE & ESE)	6
	Total	96
	Remedial Sessions Peer Tutoring Tutorials (need based & Optional)	6

II.Course Objectives:

- To know vector valued functions and operations on vecors
- To find derivatives of vector valued functions
- Familiar with divergence and curl
- To know Green's theorem , Stokes theorem and Divergence theorem
- Applying above theorems to evaluate volume and surface area.
- To Describe and classify different conics and their properties
- To familiar with group structure, subgroups, cuclic groupsand permutation groups

III. Course Delivery Plan

The teaching methods include lectures, discussions, assignments, etc.

St. Albert's College (Autonomous) Ernakulam-682018

Topics	Session No & Date(s)	Methodology and Duration
These are the topics to be covered in the modules		
Curves in space and their tangents, Arc length in space, Curvature and Normal Vectors of a curve, Directional Derivatives and Gradient Vectors.	01/06/2018 to 02/07/2018	Class exercises, Discussions, Lectures
Line Integrals, Vector fields and line integrals: Work, Circulation and Flux. Path independence, Conservation Fields and Potential Functions , Green's theorem in Plane (Statement and problems only), Surface area and Surface integral, Stoke's theorem(Statement and Problems only), the Divergence theorem and a Unified theory (Statement and simple problems only).	03/07/2018 to 04/08/2018	Lectures, Discussions, Class exercises
Polar coordinates, Conic sections, Conics in Polar coordinates.	05/08/2018 to 30/08/2018	Lectures, Class exercises
Groups, Subgroups, Cyclic groups, Groups of Permutations, Homomorphism.	31/08/2018 to 30/09/2018	Lectures, Class exercises

II. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time
Illustration of example of derivative of vector valued functions with videos	3 Hour	Experiential Learning	1st week of July

St. Albert's College Ernakulam-682018

Formation of conics with videos	1 hour	Experiential learning	1st week of Sep	

III. Assignments and Seminars

Assignments

No	Topics	Activity	Submission Deadlines	
Assignment 1	Assignment on given topic	Preparation of assignment	09/07/2018	Submit the assignment before the due date
Assignment 2	Assignment on given topic	Preparation of assignment	20/08/2018	Submit the assignment before the due date

Note: Failure to submit the assignment on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.

Rev. Dr. A. O. KONNULLY MEMORIAL
St. Albert's College
Ernakulam-682018

IV. Attendance (one component in class participation):

>90%	A
85-90%	B
80-85%	C
75-80%	D
<75	**E-Not eligible for appearing for ESE**

V. Required reading:

1. George B. Thomas, Jr: Thomas' Calculus Twelfth Edition, Pearson.
2. 2. John B Fraleigh – A First course in Abstract Algebra (Seventh Edition) A. H Siddiqi , P Manchanada : A first Course in Differential Equations with Applications (Macmillan India Ltd 2006)
3. Harry F. Davis & Arthur David Snider: Introduction to Vector Analysis, 6th ed.,
4. 2. Universal Book Stall, New Delhi.
5. 3. Murray R. Spiegel: Vector Analysis, Schaum's Outline Series, Asian Student edition.
6. 4. I.N. Herstein - Topics in Algebra
7. 5. Joseph A Gallian - A Contemporary Abstract Algebra, Narosa Publishing House

St. Albert's College (Autonomous)

MAT3CRT0301 MULTIVARIATE CALCULUS AND INTEGRAL TRANSFORMS

Course Instructor

Name	Sem, Programme& Batch	Email
Jeema Jose	Sem 3 MSc ,2018-19	jeemajose@alberts.edu.in

I. Duration of Course:

No	Activity	Duration
1	Contact hours	90(Including assignments)
2	Assessment (CAE & ESE)	6
	Total	**96**
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	**6**

II.Course Objectives:

- 1. Calculate partial derivatives, directional derivatives and total derivatives of multivariable functions.
- 2. Know the Mean value theorem for vector valued functions.
  3. Use the Chain Rule.
- 4. Find and classify critical points of functions, using the second derivative test.
- 5. Find maximum and minimum values for a function defined on a closed, bounded, planar set.

II. Course Delivery Plan

This course is a course requiring lot of student centric learning processes. The teaching methods include lectures, discussions, assignments, Seminars etc.

Topics	Session No & Date(s)	Methodology and Duration
These are the topics to be covered in the modules		
The Weirstrass theorem, other forms of Fourier series, the Fourier integral theorem, the exponential form of the Fourier integral theorem, integral transforms and convolutions, the	1/06/2018 to 29/06/2018	Lectures, Problem solving

Rev. Dr. A. O. KONNULLY
St. Albert's College
Ernakulam-682018
Research Centre & Postgradute Department of Mathematics

convolution theorem for Fourier transforms.		
The directional derivative, directional derivatives and continuity, the total derivative, the total derivative expressed in terms of partial derivatives, An application of complex- valued functions, the matrix of a linear function, the Jacobian matrix, the chain rate matrix form of the chain rule	02/07/2018 TO 24/07/2018	Class exercises Lectures Discussions Videos Illustration with examples
Implicit functions and extremum problems, the mean value theorem for differentiable functions, a sufficient condition for differentiability, a sufficient condition for equality of mixed partial derivatives, functions with non-zero Jacobian determinant, the inverse function theorem (without proof), the implicit function theorem (without proof), extrema of real-valued functions of one variable, extrema of real- valued functions of several variables.	25/07/2018 TO 14/08/2018	Lectures, Discussions, Class exercises
Integration, primitive mappings, partitions of unity, change of variables, differential forms, Stokes theorem (without proof)	29/08/ 2018 TO 24/09/2018	GD, Lectures, Class exercises, Presentations by students

III. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time
Visualisation of derivatives	1 Hour	Experiential Learning	1st Week
Illustrations with examples of theorems and concepts	5 Hours	Experiential learning	2nd Week
Visualisation of examples using GEOGEBRA	3 hrs	Experiential learning	6th week

IV. Assignments and Seminars

Assignments

No	Topics	Activity	Submission Deadlines	
Assignment	Assignment on given topic	Preparation of assignment	18th July 2018	Submit the assignment before 26th July
Seminar	PowerPoint presentation on given topic	PowerPoint Presentation for a presentation of 30 minutes duration	**09/08/2018 to 31/08/2018**	Submit the report before 7th August

Note: Failure to submit the assignment on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.

V. Attendance (one component in class participation):

90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	**Not eligible for appearing for ESE**

VI. Required reading:

1. Tom APOSTOL, Mathematical Analysis, Second edition, Narosa Publishing House.
2. WALTER RUDIN, Principles of Mathematical Analysis, Third edition – International Student Edition
3. Limaye Balmohan Vishnu, Multivariate Analysis, Springer.
4. Satish Shirali and Harikrishnan, Multivariable Analysis, Springer

St. Albert's College (Autonomous), Ernakulam

MAT4CMT0117: FOURIER SERIES, LAPLACE TRANSFRM AND COMPLEX ANALYSIS

Course Instructor

Name	Sem, Programme& Batch	Email
Anju M.M, Mary Alphonsa, Ashitha	Sem 4 B.Sc(Complementary), 2018-2019	anjumm@alberts.edu.in, maryalphonsa@alberts.edu.in Ashitha@alberts.edu.in

I. Duration of Course:

No	Activity	Duration
1	Contact hours	90(Including assignments)
2	Assessment (CAE & ESE)	6
	Total	96
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	6

II Course Objectives:

- conceive the concept of analytic functions and will be familiar with the elementary complex functions and their properties
- familiar with the theory and techniques of complex integration
- Compute Fourier series of functions.
- Compute Laplace transforms of functions.
- Solve differential equations using Laplace Transforms

III. Course Delivery Plan

This course is a course requiring lot of student centric learning processes. The teaching methods include lectures, discussions, assignments, etc.

St. Albert's College Ernakulam-682018

Topics	Session No & Date(s)	Methodology and Duration
These are the topics to be covered in the modules **Fourier Series and Legendre Polynomials :** Periodic Functions, Trigonometric Series, Fourier Series, Functions of any period p = 2L, Even and Odd functions, Half range Expansions. A brief introduction to power series and power series method for solving Differential equations. Legendre equation and Legendre polynomials ( ).	05/11/2018 to 10/12/2018	Class exercises, Discussions, Lectures
Laplace Transforms : Laplace Transform, Inverse Laplace transform, Linearity, Shifting, transforms of Derivatives and Integrals, Differential Equations, Differentiation and Integration of Transforms, Laplace transform general Formula(relevant formulae only), Table of Laplace Transforms(relevant part only)	11/12/2018 to 09/01/2019	Lectures, Discussions, Class exercises
Complex Numbers and Functions Complex Numbers, Complex Plane, Polar form of Complex Numbers, Powers and Roots, Derivative, Analytic Functions, Cauchy-Riemann Equations, Laplace's Equation, Exponential Function, Trigonometric Functions, Hyperbolic Functions, Logarithm, General Power.	10/01/2019 to 05/02/2019	Lectures, Class exercises
Complex Integration: Line Integral in the Complex Plane, Cauchy's Integral Theorem, Cauchy's Integral Formula, Derivatives of Analytic functions.	06/02/2019 to 01/03/2019	Lectures, Class exercises

II. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time
Illustration of the graph of periodic functions	3 Hour	Experiential Learning	2nd week of November
Google search and know more about the origin of Complex numbers	1 hour	Self-learning	2nd week of January

III. Assignments and Seminars

Assignments

No	Topics	Activity	Submission Deadlines	
Assignment 1	Assignment on given topic	Preparation of assignment	14/12/2018	Submit the assignment before the due date
Assignment 2	Assignment on given topic	Preparation of assignment	11/01/2019	Submit the assignment before the due date
Assignment 3	Assignment on the given topic	Preparation of Assignment	05/02/2019	Submit the assignment before the due date

Note: Failure to submit the assignment on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.

IV. Attendance (one component in class participation):

>90%	5
85-90%	4
80-85%	3
75-80%	2
<75	1-Not eligible for appearing for ESE

V. Required reading:

1. **Erwin Kreyszig, Advanced Engineering Mathematics, Eighth Edition, Wiley, India.**
2. Michael D Greenberg Advanced Engineering Mathematics, Pearson Education, 2002.
3. B.S.Grewal, Higher Engineering Mathematics, 42nd Edition, Khanna Publishers
4. Brown and Churchill, Complex Variables and Applications, McGraw-Hill Higher Education, Edition 8, 2008.

St. Albert's College (Autonomous)

STATISTICAL INFERENCE

Course Instructor

Name	Sem, Programme& Batch	Email
Ms. Amritha K Madhav	Sem 4 BSc, 2018-19	**amrithakmadhav555@gmail.com**

1. Duration of Course:

No	Activity	Duration
1	Contact hours	74(Including assignments)
2	Assessment (CAE & ESE)	6
	Total	**80**
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	**6**

II.Course Objectives:

- Point and interval estimation of unknown parameters and their significance using large and small samples.
- The basic concepts like hypothesis and its types, types of errors
- Sampling distributions of different statistic: mean, variance, chi-square, t and F
- Understand nonparametric tests for single sample and two samples

III. Course Delivery Plan

This course is a course requiring lots of student centric learning processes. The teaching methods include lectures, discussions, assignments, Seminars etc.

Topics	Session No & Date(s)	Methodology and Duration
These are the topics to be covered in the modules		
Point Estimation Concepts of Estimation, Estimators and Estimates. Point and interval estimation. Properties of good estimators- unbiasedness, efficiency, consistency and sufficiency. factorization theorem(statement). (problems based on these topics).	05/11//2018 TO 30/11/2018	Class exercises Lectures Discussions Illustration with examples
Methods of Estimation, Interval Estimation Methods of moments, maximum likelihood. Invariance property of ML Estimators (without proof).minimum variance. Cramer-Rao inequality(statement only) 100(1-α)% confidence intervals for mean, variance and proportions(problems based on these topics).	01/12/2018 TO 31/12/2018	Lectures, Discussions, Class exercises
Testing of Hypotheses, Large Sample Tests Statistical hypotheses, null and alternate hypotheses, simple and composite hypotheses, type-I and type-II errors. Critical Region. Size and power of a test, p-value, Neyman-Pearson approach. Large sample tests - z-tests for means, difference of means, proportion and difference of proportion, chi-square tests for independence, homogeneity.	01/01/ 2019 TO 31/01/2019	GD, Lectures, Class exercises, Presentations by students
Small Sample Tests Normal tests for mean, difference of means and proportion (when σ known), t-tests for mean and difference of means (when σ unknown), paired t-test, test for proportion(binomial), chi-square test, F-test for ratio of variances. (derivation not required)	01/02/2019 TO 22/02/2019	GD, Lectures, Class exercises

2. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time

Visualisation of different research methods using videos	1 Hour	Experiential Learning	1st Week
Illustrations with examples of theorems and concepts	5 Hours	Experiential learning	2nd Week

3. Assignments and Seminars

Assignments

No	Topics	Activity	Submission Deadlines	
Assignment	Assignment on given topic	Preparation of assignment	29th Nov 2018	Submit the assignment to Google Classroom before 11.59 pm
Seminar	PowerPoint presentation on given topic	PowerPoint Presentation for a presentation of 30 minutes duration	**01/01/2019 to 10/01/2019**	Submit the report before 15th January

Note: Failure to submit the assignment on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.

4. Attendance (one component in class participation):

90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	**Not eligible for appearing for ESE**

5. Required reading:

1. Goon A. M., Gupta M. K., and Dasgupta B.(2005). Fundamentals of Statistics, Vol. I, 8th edition, World Press, Kolkatta.
2. Gupta S. C. and Kapoor V. K.(2002). Fundamentals of Mathematical Statistics, 11th edition, Sultan Chand and Sons.
3. Hogg R. V., Mckean J. W., and Craig A. T.(2014). Introduction to Mathematical Statistics, 6th edition, Pearson Education Inc.

4. R.S.N. Pillai, Bagavathi(2010). STATISTICS- Theory and Practice, S.Chand publications.
5. Miller, I. and Miller, M.(2014). Mathematical Statistics, 8th edition, Pearson EducationInc.
6. Medhi J.(2006). Statistical Methods, 2nd edition, New Age International Publishes.

St. Albert's College (Autonomous)

MAT4CRT0117 Vector Calculus, Theory of Numbers and Laplace Transforms

Course Instructor

Name	Sem, Programme & Batch	Email
Dr. Shery Fernandez, Ashitha	Sem 4 BSc ,2018-19	sheryfernandez@yahoo.co.in ashitha@alberts.edu.in

I. Duration of Course:

No	Activity	Duration
1	Contact hours	90(Including assignments)
2	Assessment (CAE & ESE)	6
	Total	**96**
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	**6**

II.Course Objectives:

- familiarise the applications of Mathematics to Physics
- make the students capable of solving Physical problems using vector analysis
- give a simple account of theory of numbers and Laplace transforms

III. Course Delivery Plan

The teaching methods include lectures, discussions, assignments, etc.

Topics	Session No & Date(s)	Methodology and Duration
These are the topics to be covered in the modules		
Vector Differentiation: (A quick review of vectors) A vector equation and parametric equations for lines and equation for a plane in space only(the distance from a point to a a line and a plane and angle between planes are excluded) Vector functions, Arc length and unit tangent vector, Curvature and the unit normal vector , Tangential and normal Components of acceleration , Directional derivatives and Gradient vectors, tangent planes and normal lines only	5/11/2018 TO 7/12/2018	Lectures, Discussions, Class exercises
Line integrals, Vector fields and line integrals, work circulation and flux, Path independence,conservative fields and potential functions(Proofs of theorems excluded) ,Green's theorem in the plane(Statement and problems only), Surfaces and area:Parametrisations of surfaces, Implicit surfaces, Surface integrals, Stokes' theorem (statement and simple problems only), Divergence theorem only (statement and problems only)Gauss' law onwards are excluded	10/12/2018 TO 18/01/2019	Lectures, Discussions, Class exercises
Theory of Numbers: Basic properties of congruence, Fermat's theorem,Wilson's theorem,Euler's phi function	21/01/ 2019 TO 8/02/2019	Lectures, Class exercises,
Laplace transforms: Laplace transform, Linearity of Laplace transform,First shifting theorem, Existence of Laplace	11/2/2019 TO 27/2/2019	Lectures, Class exercises

transform, Transforms of derivatives, solution of ordinary differential equation and initial value problem, Laplace transform of the integral of a function, Convolution and integral equations

II. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time
Visual understanding of all concepts in first module	3 Hour	Experiential Learning	2nd Week
Visual understanding of Green's theorem, Stoke's theorem and Divergence theorem	3 Hours	Experiential learning	11th Week

III. Assignments and Seminars

Assignments

No	Topics	Activity	Submission Deadlines	
Assignment 1	Assignment on given topic	Preparation of assignment	9th November 2018	Submit the assignment before 23rd November, 2018
Assignment 2	Assignment on given topic	Preparation of assignment	11th January , 2019	Submit the assignment before 25th January , 2019

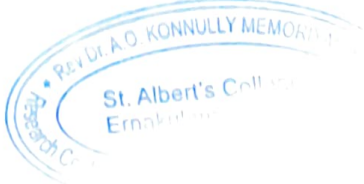
Note: Failure to submit the assignment on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.

IV. Attendance (one component in class participation):

>90% A

85-90% B

80-85% C



75-80%	D
<75	**E- Not eligible for appearing for ESE**

V. Required reading:

1. H.F. Davis and A.D. Snider: Introduction to Vector Analysis, 6th ed., Universal Book Stall, New Delhi.
2. Shanti Narayan, P.K Mittal – Vector Calculus (S. Chand)
3. Merle C. Potter, J. L. Goldberg, E. F. Aboufadel – Advanced Engineering Mathematics (Oxford)
4. Ghosh, Maity – Vector Analysis (New Central books)

St. Albert's College (Autonomous)

MATSCRT101 MATHEMATICAL ANALYSIS

Course Instructor

Name	Sem, Programme& Batch	Email
Jeema Jose, Mary Alphonsa	Sem V BSc, 2018-19	jeemajose@alberts.edu.in maryalphonsa@alberts.edu.in

I. Duration of Course:

No	Activity	Duration
1	Contact hours	80(Including assignments)
2	Assessment (CAE & ESE)	6
	Total	**86**
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	**6**

II.Course Objectives:

- Define and recognize the basic properties of real numbers
- Define and recognize the series of real numbers and convergence.
- Have the knowledge of real functions-limits of functions and their properties.
- Studying the notion of continuous functions and their properties
- Recognize the differentiability of real functions and its related theorems
- Define the real numbers, least upper bounds, and the triangle inequality.
- Define functions between sets; equivalent sets; finite, countable and uncountable sets. Recognize convergent, divergent, bounded, Cauchy and monotone sequences.
- Calculate the limit superior, limit inferior, and the limit of a sequence.
- Recognize alternating, convergent, conditionally and absolutely convergent series.
- Apply the ratio, root, limit and limit comparison tests.

II. Course Delivery Plan

This course is a course requiring lot of student centric learning processes. The teaching methods include lectures, discussions, assignments, Seminars etc.

Topics	Session No & Date(s)	Methodology and Duration
These are the topics to be covered in the modules		
Neighbourhood of a point. Interior point of a set. Open set. Limit point of a set. Bolzano weierstrass theorem for sets. Closed sets, closure of a set. Dense sets. Countable and uncountable sets.	1/06/2018 TO 2/07/2018	Class exercises Lectures Discussions Illustration with examples
Real sequences. The range, bounds of a sequence. Convergence of sequences. Some theorems, limit points of a sequence. Bolzano weierstrass theorem for sequences. Limit interior and superior. Convergent sequences. Cauchy's general principle of convergence. Cauchy's sequences. Statements of theorem without proof in algebra of sequences. Some important theorems and examples related to them. Monotonic sequences, subsequences.	3/07/2018 TO 12/08/2018	Lectures, Discussions, Class exercises Analysing limit and continuity using GEOGEBRA
Sums and products. Basic algebraic properties. Further properties. Vectors and moduli. Different representations. Exponential forms. Arguments of products and quotients. Product and powers in exponential form. Foots of complex numbers. Regions in the complex plane.	13/08/ 2018 TO 28/08/2018	GD, Lectures, Class exercises
Limits of Functions, Limit Theorems, Some Extensions of the Limit Concept.	29/08/2018 TO 30/09/2018	GD, Lectures, Class exercises Visualisation of examples using GEOGEBRA

III. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time

Visualisation of limit and continuity concepts using GEOGEBRA	3 hours	Experiential Learning	3rd Week
Illustrations with examples of theorems and concepts	5 Hours	Experiential learning	2nd Week

IV. Assignments and Seminars

Assignments

No	Topics	Activity	Submission Deadlines	
Assignment 1	Finding supremum and infimum	Preparation of assignment Referring text book and	14th June 2018	Submit the assignment to Google Classroom before 16th June
Assignment 2	Establishing convergence of sequences		18th July	Submit the assignment to Google Classroom before 21st July
Assignment 3	Establishing continuity of functions		13th August	Submit the assignment to Google Classroom before 16st August

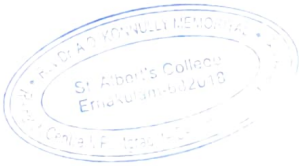
Note: Failure to submit the assignment on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.

V. Attendance (one component in class participation):

90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	**Not eligible for appearing for ESE**

VI. Required reading:

1. Robert G Bartle and Donald R Sherbert –Introduction to real analysis 3rd edition.Wiley
2. Richard R Goldberg – Methods of real analysis 3rd edition , Oxford and IBM Publish
   ing Co (1964)
3. Shanti Narayan – A Course of mathematical analysis , S Chand and Co Ltd(2004)
4. Elias Zako – Mathematical analysis Vol1, Overseas Press, New Delhi(2006)
5. J. M .Howie – Real Analysis, Springer 2007
6. K.A Ross - Elementary Real Analysis, Springer, Indian Reprint
7. M.R Spiegel – Complex Variables, Schaum's Series



St. Albert's College (Autonomous)

DIFFERENTIAL EQUATIONS

I. Course Instructor

Name	Sem, Programme& Batch	Email
Jini Johny, Mary Alphonsa	Sem 5, B.Sc. Mathematics, 2018-19	jinijohny@alberts.edu.in maryalphonsa@alberts.edu.in

II. Duration of Course:

No	Activity	Duration
1	Contact hours	80
2	Assessment (CAE & ESE)	3
	Total	83
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	7

III. Course Objectives:

- To familiarise about differential equations
- To learn to solve ODEs of first and second order
- To understand the power series solution of ODEs
- To know about origin and solution of PDEs

IV. Course Delivery Plan

Topics	Session No & Date(s)	Methodology and Duration
Topics	Session No & Date(s)	Methodology and Duration
These are the topics to be covered in the modules Exact differential equations and integrating factors (proof of theorem 2.1 excluded), separable equations and equations reducible	01.06.2018 to 05.07.2018	Lectures Discussion Problem Solving

		Categorising
to this form,, linear equations and Bernoulli equations, special integrating factors and transformations. Orthogonal and oblique trajectories.		
Basic theory of linear differential equations. The homogeneous linear equation with constant coefficients. The method of undetermined coefficients, Variation of parameters, The Cauchy – Euler equation.	06-07-2018 to 08-08-2018	Lectures Discussion Problem Solving Categorising
Power series solution about an ordinary point, solutions about singular points, the method of Frobenius , Bessel's equation and Bessel Functions, Differential operators and an operator method.	09-08-2018 to 13-09-2018	Lectures Discussion Problem Solving Categorising
Surfaces and Curves in three dimensions, solution of equation of the form $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$. Origin of first order and second order partial differential equations, Linear equations of the first order, Lagrange's method	14-09-2018 to 24-09-2018	Lectures Discussion Problem Solving Categorising

V. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time
Group Discussion and presentation of challenging exercises from the text book	5 Hour	Research Based Learning	5th Week onwards
Know The Genius - Do literature review and do a presentation (of 15 minutes) about the famous mathematicians involved in the area of study	4 Hours	Literature Review/Flipped Learning	8th Week onwards

VI. Assignments and Seminars

Assignments

No	Topics	Activity	Submission Deadlines	
Assignment	Assignment on given topic	Preparation of assignment	Assignment 1 : 6th July 2018	Submit the assignment book on or before 16th July 2018
			Assignment 2 : 4th August 2018	Submit the assignment book on or before 14th August 2018

Note: Failure to submit the assignment on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.

VII. Attendance (one component in class participation):

95-100%	5
90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	**Not eligible for appearing for ESE**

VIII. Required reading:

- Shepley L. Ross - Differential Equations, 3rd ed., (Wiley India).
- Ian Sneddon – Elements of Partial Differential Equation (Tata Mc Graw Hill)
- A.H.Siddiqi & P. Manchanda – A First Course in Differential Equation with
- Applications (Macmillian)
- George. F. Simmons – Differential equation with applications and historical notes (Tata Mc Graw Hill)
- W.E. Boyce & R.C. Diprima - Elementary Differential Equations and boundary value Problems, (Wiley India)
- S. Balachandra Rao & H. Ranuradha – Differential Equation with Applications and
- Programs (Universities Press)
- R. K. Ghosh & K. C. Maity - An Introduction to Differential Equations (New Central
- Books Agency)
- B. K. Dutta – Introduction to Partial Differential Equations (New Central Books). Murrary –.Differential Equations. Macmillian
- E.A. Coddington - An Introduction to Ordinary Differential Equation, PHI.
- Sankara Rao - Introduction to Partial Differential Equation,2nd edition, PHI.
- Zafar Ahsan - Differential Equations and their Applications , 2nd edition, PHI

St. Albert's College (Autonomous)

MAT5CRT03 – ABSTRACT ALGEBRA

I. Course Instructor

Name	Sem, Programme& Batch	Email
DIVYA MARY DAISE S	Sem 5, B.Sc. Mathematics, 2018-19	divyamary@alberts.edu.in

II. Duration of Course:

No	Activity	Duration
1	Contact hour:	75
2	Assessment (CAE & ESE)	6
	Total	81
	Remedial Sessions /Peer Tutoring /Tutorials (need based & Optional)	9

III. Course Objectives:

- Recall relation and its types, functions and binary operations.
- Recognize groups with its elementary properties and classifications
- Explain cyclic groups ,normal groups, quotient groups , Isomorphism and homomorphism.
- Relate rings, its types, and elementary properties.
- Understand the subject as tool applicable to almost all other branches of Science, Engineering and Technology

IV. Course Delivery Plan

Topics	Session No & Date(s)	Methodology and Duration
Topics	Session No & Date(s)	Methodology and Duration
These are the topics to be covered in the modules		
Binary operation-Groups Definition and elementary properties-finite groups and group tables-subsets and sub groups-cyclic sub groups-functions and	01.06.2018 to 06.07.2018	Class exercises Lectures

permutations- groups of permutations-examples.Cycles and Cyclic notations-even and odd permutations-the alternating groups		
Cyclic Groups-Elementary Properties-Classification of cyclic groups-Subgroups of finite cyclic groups-Isomorphisms-Definition and elementary properties-How to show that two groups are isomorphic(Not Isomorphic)-Cayle's Theorem-Groups of Cosets--Applications-Criteria for the existence of a coset group-inner automorphisms and normal subgroups-Factor groups-Simple groups	06-07-2018 to 08-08-2018	Class exercises Lectures
Homomorphism-Definition and Elementary Properties-The Fundamental Homomorphism theorem-Applications. Rings,Definition and Basic Properties-Multiplicative questions;Fields-Integral Domains-Divisors of Zero And Cancellation-Integral Domains.	09-08-2018 to 13-09-2018	Class exercises Lectures
Characteristic of a Ring- Quotient Ring and Ideals-Criteria For The Existence of a Coset Ring-Ideals And Quotient Rings.	14-09-2018 to 24-09-2018	Class exercises Lectures

V. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time
Finding symmetries of an equilateral triangle	1 Day	Experiential learning	2nd week of July
Finding Symmetries of Dihedral Group	1 Day	Experiential learning	3rd week of July

VI. Assignments and Seminars

Assignments

The following Assignment needs to be submitted to Google Classroom

No	Topics	Activity	Submission Deadlines

Assignment	Assignment on given topic	Preparation of assignment	Assignment 1 6th July 2018 Assignment 2 4th August 2018 Assignment 3 12th September 2018	Submit the assignment book on or before the due date
Seminar	Presentation on given topic	Presentation of 15-30 minutes duration	Wednesdays of July, August, September of course	Submit the report 2 days before the seminar

Note: Failure to submit the assignment on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.

VII. Attendance (one component in class participation):

95-100%	5
90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	**Not eligible for appearing for ESE**

VIII. Required reading:

1. John B.Fraleigh - A first course in Abstract Algebra (7TH Edition)
2. I.N Herstein - Topics in Algebra
3. Joseph A Gullian - A Contemporary Abstract Algebra,Narosa Pub.House .
4. Hillbert – Algebra
5. Artin – Algebra , PHI
6. P.B Bhattacharya , S. K Jain and S. R . Nagpaul – Basic Abstract Algebra , 2nd edition, Cambridge University Press
7. Durbin – Modern Algebra , An introduction , 5th edition , Wiley
8. Chatterjee - Abstract Algebra , 2nd edition, PHI
9. M. K. Sen, S. Ghosh - Topics in Abstract Algebra (University Press)

St. Albert's College (Autonomous)

MAT5CRT04: FUZZY MATHEMATICS

Course Instructor

Name	Sem, Programme& Batch	Email
Anju M.M	Sem 5 B.Sc. ,2016-17	anjumm@alberts.edu.in

I. Duration of Course:

No	Activity	Duration
1	Contact hours	90(Including assignments)
2	Assessment (CAE & ESE)	6
	Total	**96**
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	**6**

II Course Objectives:

- Provide an understanding of the basic mathematical elements of the theory of fuzzy sets.
- Provide an emphasis on the differences and similarities between fuzzy sets and classical sets theories.
- Explain the concepts of fuzzy numbers, fuzzy logic, and fuzzy arithmetic.
- Enable students to Solve problems that are appropriately solved by fuzzy logic, and fuzzy arithmetic..

III. Course Delivery Plan

This course is a course requiring lot of student centric learning processes. The teaching methods include lectures, discussions, assignments, Seminars etc.

Topics	Session No & Date(s)	Methodology and Duration
These are the topics to be covered in the modules		
Introduction , Crisp Sets: An Overview ,Fuzzy Sets: Basic Types ,Fuzzy Sets: Basic concepts. Additional properties of α cuts. Representation of fuzzy sets, Extension principle of fuzzy sets.	01/06/2018 TO 27/06/2018	Class exercises Lectures Discussions Illustration with examples
Operations on Fuzzy Sets. Types of Operations , Fuzzy complements , Fuzzy intersections: t – norms , Fuzzy Unions: t – conorms , Combinations of operations	28/06/2018 TO 01/08/2018	Lectures, Discussions, Class exercises
Fuzzy Arithmetic Fuzzy numbers , Arithmetic operations on Intervals , Arithmetic operations on Fuzzy numbers. (Exclude the proof of Theorem 4.2) Lattice of fuzzy numbers, Fuzzy equations	02/08/ 2018 TO 06/09/2018	GD, Lectures, Class exercises.
Fuzzy Logic Classical Logic: An Overview , Multivalued Logics , Fuzzy propositions , Fuzzy quantifiers ,Linguistic Hedges, Inference from Conditional Fuzzy propositions	07/09/2018 TO 01/10/2018	GD, Lectures, Class exercises

II. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time
Visualisation of fuzzy sets and examples using videos	1 Hour	Experiential Learning	1st Week
Illustrations with examples of theorems and concepts	5 Hours	Experiential learning	2nd Week

III. Assignments and Seminars

Assignments

No	Topics	Activity	Submission Deadlines	
Assignment 1	Fuzzy set and its examples.	Preparation of assignment	30th June 2018	Submit the assignment to Google Classroom before 11.59 pm
Assignment 2	Fuzzy arithmetic - examples.	Preparation of assignment	10th September 2018	Submit the assignment to Google Classroom before 11.59 pm

Note: Failure to submit the assignment on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.

IV. Attendance (one component in class participation):

90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	**Not eligible for appearing for ESE**

V. Required reading:

1. George J. Klir and BoYuan, - *Fuzzy Sets and Fuzzy Logic Theory and Applications'*, Prentice Hall of India Private Limited New Delhi, 2000.
2. Klir, G. J and T. Folger, *Fuzzy Sets, Uncertainty and Information*, Prentice Hall of India Private Limited New Delhi, (1988)

3. H.J Zimmermann, *Fuzzy Set Theory- and its Applications*, Allied Publishers, 1996.
4. Dubois, D and H. Prade , *Fuzzy Sets and System: Theory and Applications*, Academic Press, New York, 1988
5. Abraham Kandel, *Fuzzy Mathematical Techniques with Applications*, Addison Wesley Publishing Company 1986

St. Albert's College (Autonomous)

MAT6CRT101 REAL ANALYSIS

Course Instructor

Name	Sem, Programme& Batch	Email
Jeema Jose, Mary Alphonsa	Sem VI BSc, 2018-19	jeemajose@alberts.edu.in, maryalphonsa@alberts.edu.in

I. Duration of Course:

No	Activity	Duration
1	Contact hours	80(Including assignments)
2	Assessment (CAE & ESE)	6
	Total	86
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	6

II.Course Objectives:

- To have a knowledge about the convergence of series
- Familiar with Cauchy criterion for series
- Familiar with the convergence tests such as comparison test, ratio test,Raabe's test, root test and Gauss test
- Have a knowledge about alternating series and absolute convergence
- Studying the notion of real continuous functions and their properties.
- To study the notion of uniform continuity
- Familiar with Riemann integration and integrable functions
- Recognize the Riemann integrable real functions and its related theorems
- Familiar with the test for uniform convergence of series, Weierstrass`s M-test, Abel`s test. Dirichelet`s test
- Distinguish pointwise convergence and uniform convergence

II. Course Delivery Plan

St. Albert's College Ernakulam-682018

This course is a course requiring lot of student centric learning processes. The teaching methods include lectures, discussions, assignments, Seminars etc.

Topics	Session No & Date(s)	Methodology and Duration
These are the topics to be covered in the modules		
A necessary condition for convergence. Cauchy`s general principle of convergence for a series. Positive term series. A necessary condition for convergence of positive term series. Geometric series. The comparison series $\sum \frac{1}{np} \frac{1}{np}$ comparison test for positive term series without proof. Cauchy`s root test DALEMBERTES RATIO test. Raabe's test. Gauss`s test. Series with arbitrary terms. Alternating series. Absolute convergence	2/11/2018 TO 3/12/2018	Class exercises Lectures Discussions Illustration with examples
Continuous function (a quick review). Continuity at a point, continuity in an interval. Discontinuous functions. Theorems on continuity. Functions continuous on closed intervals. Uniform continuity.	4/12/2018 TO 12/01/2019	Lectures, Discussions, Class exercises Analysing limit and continuity using GEOGEBRA
Definitions and existence of the integral. Inequalities of integrals. Refinement of partitions of integrability. Integrability of the sum of integrable functions. The integrals as the limit of a sum. Some applications. Some integrable functions. Integration and differentiation. The fundamental theorem of calculus.	13/01/ 2019 TO 30/01/2019	GD, Lectures, Class exercises
Point wise convergence. Uniform convergence on an interval. Cauchy`s criterion for uniform convergence. A test for uniform convergence of sequences. Test for uniform convergence of series. Weierstrass`s M-test, Abel`s test. Statement of Dirichelet`s test without proof.	31/07/2019 TO 28/02/2019	GD, Lectures, Class exercises Visualisation of examples using GEOGEBRA

III. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time
Visualisation of limit and continuity concepts using GEOGEBRA	3 hours	Experiential Learning	3rd Week
Illustrations with examples of theorems and concepts	5 Hours	Experiential learning	2nd Week

IV. Assignments and Seminars

Assignments

No	Topics	Activity	Submission Deadlines	
Assignment 1	Establishing continuity of functions	Preparation of assignment Referring text book and	15th Dec 2018	Submit the assignment to Google Classroom before 17th Dec
Assignment 2	Establishing uniform convergence of sequences		18th Jan 2019	Submit the assignment to Google Classroom before 21st Jan
Assignment 3	Testing uniform convergence		12th Feb 2019	Submit the assignment to Google Classroom before 16st Feb

Note: Failure to submit the assignment on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.

V. Attendance (one component in class participation):

90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	**Not eligible for appearing for ESE**

VI. Required reading:

1. S.C.Malik and Savitha Arora - mathematical Analysis, 2nd Edition.
2. Robert G Bartle and Donald R Sherbert –Introduction to real analysis 3rd edition.Wiley
3. Richard R Goldberg – Methods of real analysis 3rd edition , Oxford and IBM Publish ing Co (1964)
3. Shanti Narayan – A Course of mathematical analysis , S Chand and Co Ltd(2004)
4. Elias Zako – Mathematical analysis Vol1, Overseas Press, New Delhi(2006)
5. J. M .Howie – Real Analysis, Springer 2007
6. K.A Ross - Elementary Real Analysis, Springer, Indian Reprint
7. M.R Spiegel – Complex Variables, Schaum's Series

St. Albert's College (Autonomous)

MAT6CRT02 – COMPLEX ANALYSIS

I. Course Instructor

Name	Sem, Programme& Batch	Email
ASHITHA MARIA	Sem 6, B Sc Mathematics, 2018-19	ashitha@alberts.edu.in

II. Duration of Course:

No	Activity	Duration
1	Contact hours	75
2	Assessment : CAE & ESE	6
	Total	81
	Remedial Sessions/ Peer Tutoring/ Tutorials/ need based & Optional	9

III. Course Objectives:

- Conceive the concept of analytic functions and will be familiar with the elementary complex functions and their properties
- Familiar with the theory and techniques of complex integration
- Apply Cauchy's theorem and Cauchy's integral formula to compute definite integrals
- Familiar with the theory and application of the power series expansion of analytic functions
- Calculate residues using Cauchy's residue theorem.
- Compute definite integrals between limits $-\infty$ to ∞
- Extend the idea of integration in the complex field by using residues and evaluating contour integrals

IV Course Delivery Plan

Topics	Session No & Date(s)	**Methodology and Duration**
Topics	Session No & Date(s)	Methodology and Duration

These are the topics to be covered in the module

St. Albert's College Ernakulam-682018

9	Functions of a complex variable-limits-theorems on limits-continuity-derivatives-differentiation formulas-Cauchy-Riemann equations-sufficient condition for differentiability-analytic functions examples-harmonic functions Exponential function –logarithmic function –complex exponents –trigonometric functions- hyperbolic functions- inverse trigonometric and hyperbolic functions	05-11-2018 to 14-12-2018	Class exercises Lectures
	Derivatives of functions –definite integrals of functions –contours –contour integrals –some examples –upper bounds for moduli of contour integrals –ant derivates –Cauchy-Goursat theorem (without proof)- simply and multiply connected domains- Cauchy's integral formula- an extension of Cauchy's integral formula- Liouville's theorem and fundamental theorem of algebra- maximum modulus principle.	17-12-2018 to 17-01-2019	Class exercises Lectures
	Convergence of sequences and series -Taylor's series -proof of Taylor's theorem-examples- Laurent's series(without proof)-examples	18-01-2019 to 31-01-2019	Class exercises Lectures
	Isolated singular points –residues –Cauchy's residue theorem –three types of isolated singular points-residues at poles-examples –evaluation of improper integrals-example –improper integrals from Fourier analysis –Jordan's lemma (statement only) –definite integrals involving sines and cosines.	01-02-2019 to 17-02-2019	Class exercises Lectures

V. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time
Know the man Cauchy - Prepare a short report about	1 Week	Self Learning	2nd week of December

Augustus Cauchy- His life & Contributions Steriographic Projection – Google Search and prepare a report	1 Week	Self Learning	2nd week of February

VI. Assignments and Seminars

Assignments

No	Topics	Activity	Submission Deadlines	
Assignment	Assignment on given topic	Preparation of assignment	Assignment 1 6th December 2018 Assignment 2 8th January 2019 Assignment 3 13th February 2019	Submit the assignment book on or before the due date
Seminar	Presentation on given topic	Presentation of 15-30 minutes duration	Monday's of December, January & February of course	Submit the report 2 days before the seminar

Note: Failure to submit the assignment on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.

VII. Attendance (one component in class participation):

95-100%	5
90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	**Not eligible for appearing for ESE**

VIII. Required reading:

1. James Ward Brown& Ruel. V. Churchill- Complex variables and applications (8th edition)
2. Lars V Ahlfors - Complex Analysis – An Introduction to the Theory of Analytic Functions of one Complex Variables (4th edition), (McGRAW-HILL)
3. Shanti Narayan - Theory of functions of a complex variable
4. Kasana - Complex Variables: Theory and Applications , 2nd edition
5. B. Choudhary - The Elements of Complex Variables

St. Albert's College (Autonomous)

DISCRETE MATHEMATICS

I. Course Instructor

Name	Sem, Programme & Batch	Email
DIVYA MARY DAISE S	Sem 6, B.Sc. Mathematics, 2018-19	divyamary@alberts.edu.in

II. Duration of Course:

No	Activity	Duration
1	Contact hours	80
2	Assessment (CAL & LSL)	3
	Total	83
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	7

III. Course Objectives:

- Familiarise the basic concepts and famous applications of graph theory
- Know about the basics of cryptography
- Learn about Posets, Lattices, Semilattices, Complete Lattices, Sublattices

IV. Course Delivery Plan

Topics	Session No & Date(s)	Methodology and Duration
Topics	Session No & Date(s)	Methodology and Duration
These are the topics to be covered in the modules An introduction to graph. Definition of a Graph, Graphs as models, More definitions, Vertex Degrees, Sub graphs, Paths and cycles The matrix representation of graphs (definition & example only) Trees and connectivity. Definitions and Simple properties, Bridges, Spanning trees, Cut vertices and connectivity.	05-11-2018 to 14-12-2018	Lectures Description of real life examples Class discussions

St. Albert's College
Ernakulam-682018
Research Centre & Postgradute Department of Mathematics

Euler Tours and Hamiltonian Cycles .Euler's Tours, The Chinese postman problem .Hamiltonian graphs, The travelling salesman problem, Matching and Augmenting paths, Hall's Marriage Theorem-statement only, The personnel Assignment problem, The optimal Assignment problem (Section 3.1(algorithm deleted) 3.2(algorithm deleted), 3.3, 3.4 (algorithm deleted)) Matching	17-12-2018 to 17-01-2019	Lectures Description of real life examples Class discussions
From Caesar Cipher to Public key Cryptography, the Knapsack Cryptosystem	18-01-2019 to 31-01-2019	Lectures Description of real life examples Class discussions
Diagramatical Representation of a Poset, Isomorphisms, Duality, Product of two Posets, Lattices, Semilattices, Complete Lattices, Sublattices.	01-02-2019 to 17-02-2019	Problem Solving Lectures Class discussions

V. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time
Group Discussion and presentation of challenging exercises from the text book	5 Hour	Research Based Learning	5th Week onwards
Know The Genius - Do literature review and do a presentation (of 15 minutes) about the famous mathematicians involved in the area of study	4 Hours	Literature Review/Flipped Learning	8th Week onwards

VI. Assignments and Seminars

Assignments

No	Topics	Activity	Submission Deadlines

St. Albert's College Ernakulam-682018

Assignment	Assignment on given topic	Preparation of assignment	Assignment 1 : 6th December 2018 Assignment 2 4th January 2019	Submit the assignment book on or before 16th December 2018 Submit the assignment book on or before 14th January 2019

Note: Failure to submit the assignment on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.

VII. Attendance (one component in class participation):

95-100%	5
90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	**Not eligible for appearing for ESE**

VIII. Required reading:

- John Clark Derek Allen Holton - A first look at graph theory, Allied Publishers
- David M Burton - Elementary Number Theory 6th Edition TMH
- Vijay K. Khanna - Lattices and Boolean Algebras- First Concepts, Vikas Publishing House Pvt Ltd.
- Douglas B West Peter Grossman - Introduction to Graph Theory
- W.D.Wallis - A Biginner's Guide to Discrete Mathematics, Springer
- R. Balakrishnan, K. Ranganathan - A textbook of Graph Theory, Springer International Edition
- S.Arumugham, S. Ramachandran - Invitation to Graph Theory, Scitech. Peter Grossman,
- J.K Sharma - : Discrete Mathematics(2nd edition), (Macmillion)
- S. A. Choudam –A First Course in Graph Theory (Macmillian)

Assignment	Assignment on given topic	Preparation of assignment	Assignment 1 6th December 2018	Submit the assignment book on or before 16th December 2018
			Assignment 2 4th January 2019	Submit the assignment book on or before 14th January 2019

Note: Failure to submit the assignment on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.

VII. Attendance (one component in class participation):

95-100%	5
90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	**Not eligible for appearing for ESE**

VIII. Required reading:

- John Clark Derek Allen Holton - A first look at graph theory, Allied Publishers
- David M Burton - Elementary Number Theory 6th Edition TMH
- Vijay K. Khanna - Lattices and Boolean Algebras- First Concepts, Vikas Publishing House Pvt Ltd.
- Douglas B West Peter Grossman - Introduction to Graph Theory
- W.D.Wallis - A Biginner's Guide to Discrete Mathematics, Springer
- R. Balakrishnan, K. Ranganathan - A textbook of Graph Theory, Springer International Edition
- S.Arumugham, S. Ramachandran - Invitation to Graph Theory, Scitech. Peter Grossman,
- J.K Sharma - : Discrete Mathematics(2nd edition), (Macmillion)
- S. A. Choudam –A First Course in Graph Theory (Macmillian)

St. Albert's College (Autonomous)

MAT6CRT04: LINEAR ALGEBRA AND METRIC SPACES

Course Instructor

Name	Sem, Programme& Batch	Email
Dr. Shery Fernandez	Sem 6 B.Sc. ,2018-19	sheryfernandez@yahoo.co.in

I. Duration of Course:

No	Activity	Duration
1	Contact hours	90(Including assignments)
2	Assessment (CAE & ESE)	6
	Total	**96**
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	**6**

II.Course Objectives:

- understand vector spaces as an abstract algebraic system and establish some of the properties of such systems
- find the widest applications of linear algebra in Physics, Chemistry, Economics etc.
- explain the geometric meaning of each of the metric space properties and be able to verify whether a given distance function is a metric
- distinguish between open and closed balls in a metric space and be able to determine them for given metric spaces

- define convergence for sequences in a metric space and determine whether a given sequence in a metric space converges
- state the definition of continuity of a function between two metric spaces.

III. Course Delivery Plan

This course is a course requiring lot of student centric learning processes. The teaching methods include lectures, discussions, assignments, Seminars etc.

Topics	Session No & Date(s)	Methodology and Duration
These are the topics to be covered in the modules		
Vector spaces: Vectors, Subspace, Linear Independence, Basis and Dimension, Row Space of a Matrix.	05/11/2018 TO 03/12/2018	Class exercises Lectures Discussions Illustration with examples
Linear Transformations: Functions, Linear Transformations, Matrix Representations, Change of Basis, Properties of Linear Transformations.	04/12/2018 TO 16/01/2019	Lectures, Discussions, Class exercises
Metric Spaces – Definition and Examples, Open sets, Closed Sets. , Cantor set	17/01/ 2019 TO 04/02/2019	GD, Lectures, Class exercises.
Convergence, Completeness, Continuous Mapping (Baire's Theorem included)	05/02/2019 TO 01/03/2019	GD, Lectures, Class exercises

II. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time
Visualisation of vector space and examples using videos	1 Hour	Experiential Learning	1st Week
Illustrations with examples of theorems and concepts	5 Hours	Experiential learning	2nd Week

III. Assignments and Seminars

Assignments

No	Topics	Activity	Submission Deadlines	
Assignment 1	Vector space and its examples	Preparation of assignment	5th December 2018	Submit the assignment to Google Classroom before 11.59 pm
Assignment 2	Metric spaces and its examples	Preparation of assignment	10th February 2019	Submit the assignment to Google Classroom before 11.59 pm

Note: Failure to submit the assignment on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.

IV. Attendance (one component in class participation):

90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	**Not eligible for appearing for ESE**

V. Required reading:

1. Richard Bronson, Gabriel B. Costa - Linear Algebra An Introduction (Second Edition), Academic Press 2009, an imprint of Elsevier.

2. David C Lay: Linear Algebra, Pearson

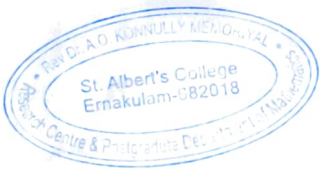
3. Sheldon Axler - Linear Algebra Done Right (Third Edition, Undergraduate text in Mathematics), Springer 2015.

4. S. H. Friedberg, Arnold J. Insel and Lawrence E. Spence, - Linear Algebra, 2nd

5. Edition, PH Inc.

6. S. Kumaresan - Linear Algebra: A Geometric Approach, Prentice Hall India Learning Private Limited; New title edition (2000)

7. Gilbert Strang – Linear Algebra and its applications, Thomson Learning,



St. Albert's College (Autonomous)

[redacted] BASIC TOPOLOGY PMT1CRT02

Course Instructor		
Name	Sem, Programme& Batch	Email
Jeema Jose	Sem I MSc ,2018-19	jeemajose@alberts.edu.in

I. Duration of Course:

No	Activity	Duration
1	Contact hours	90(Including assignments)
2	Assessment (CAE & ESE)	6
	Total	96
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	6

II.Course Objectives:

- Work with topological definitions and theorems
- Produce examples and counter examples that illustrate why theorem hypotheses are necessary or why a statement is not true
- Draw pictures to represent topological ideas
- Formulate conjectures about topological concepts and test these conjectures.
- Prove topological statements
- Use topological ideas (e.g., homeomorphisms, fundamental group) to classify spaces
- Present mathematical arguments both orally and in writing.

II. Course Delivery Plan

This course is a course requiring lot of student centric learning processes. The teaching methods include lectures, discussions, assignments, Seminars etc.

Topics	Session No & Date(s)	Methodology and Duration

These are the topics to be covered in the modules Revision		
Definition of a topological space – examples of topological spaces, bases and sub bases – sub spaces. Basic concepts: closed sets and closure – neighborhood, interior and accumulation points	21/06/2018 TO 22/07/2018	Class exercises Lectures Discussions Videos Illustration with examples
Continuity and related concepts: making functions continuous, quotient spaces. Spaces with special properties: Smallness condition on a space	23/07/2018 TO 20/08/2018	Lectures, Discussions, Class exercises
Connectedness: Local connectedness and paths	21/08/ 2018 TO 20/09/2018	GD, Lectures, Class exercises, Presentations by students
Separation axioms: Hierarchy of separation axioms – compactness and separation axioms	21/09/2018 TO 28/10/2018	GD, Lectures, Class exercises Visualisation of examples using GEOGEBRA

III. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time
Visualisation of topologically equivalent objects using videos	1 Hour	Experiential Learning	1st Week
Illustrations with examples of theorems and concepts	5 Hours	Experiential learning	2nd Week
Visualisation of examples using GEOGEBRA	3 hrs	Experiential learning	6th week

IV. Assignments and Seminars

Assignments

No	Topics	Activity	Submission Deadlines

Assignment	Assignment on given topic	Preparation of assignment	18th July 2018	Submit the assignment to before 20th July
Seminar	PowerPoint presentation on given topic	PowerPoint Presentation for a presentation of 30 minutes duration	**11/08/2018 to 28/08/2018**	Submit the report before 8th August

Note: Failure to submit the assignment on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.

V. Attendance (one component in class participation):

90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	**Not eligible for appearing for ESE**

VI. Required reading:

1. K.D Joshi , Introduction to General Topology , Wiley Eastern Ltd, 1984
2. George F. Simmons, Introduction to Topology and Modern Analysis, McGrawHill Book Company,1963
3. I.M. Singer &J.A. Thorpe ,Lecture Notes on Elementary Topology &Geometry, Springer Verlag 2004
4. Munkres J.R, Topology-A First Course, Prentice Hall of India Pvt. Ltd., New Delhi, 2000.
5. J.L Kelley, General Topology, Van Nostrand, Reinhold Co., New York, 1995.
6. Stephen Willard, General Topology, Addison-Wesley.
7. Dugundji, Topology, Universal Book Stall, New Delhi.

St. Albert's College (Autonomous)

PMT1CRT03 - Measure Theory and Integration

Course Instructor

Name	Sem, Programme& Batch	Email
Divya Mary Daise S	Sem 1, M Sc Mathematics, 2018-19	divyamary@alberts.edu.in

I. Duration of Course:

No	Activity	Duration
1	Contact hours	75(Including assignments)
2	Assessment (CAE & ESE)	5
	Total	90
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	10

II.Course Objectives:

- To understand the concept of Lebesgue Measure
- To familiarise the concepts Lebesgue Measurable Functions and Lebesgue Integration
- To learn about General Measure Space, Measureable Functions and Integration over General Measure Space
- To know about Signed Measures
- To learn about Product Measures

III. Course Delivery Plan

The teaching methods include lectures, discussions, assignments, Seminars etc.

Rev. Dr. A.O. KONNULLY MEMORIYAL * St. Albert's College Ernakulam-682018 * Research Centre & Postgraduate Department of Mathematics

Topics	Session No & Date(s)	Methodology and Duration
These are the topics to be covered in the modules		
Module 1: Lebesgue Measure: Introduction, outer measure, mesurable sets and Lebesgue measure, Non measureable sets, Measurable functions	20/06/18 to 23/07/18	Lectures, Discussions, Assignments, Class exercises
Module 2: Lebesgue Integration: The Riemann Integral – The Lebesgue integral of a bounded measurable function over a set of finite measure – The Lebesgue integral of a measurable non negative function – The general Lebesgue integral, differentiation of monotone functions.	24/07/18 to 09/08/18	Lectures, Discussions, Assignments, Class exercises
Module 3: Measure and Integration: measure spaces, measurable functions, integration, general convergence theorems, signed measures, the radon-nikodym theorem, outer measure and measurability, the extension theorem	10/08/18 to 29/09/18	Lectures, Discussions, Assignments, Class exercises
Module 4: Convergence in measure, almost uniform convergence, measurability in a product space, the product measure and fubini's theorem	01/10/18 to 24/10/18	Lectures, Student Presentations, Discussions

II. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time
Group Discussion and presentation of challenging exercises from the text book	5 Hour	Research Based Learning	5th Week onwards
Know The Genius - Do literature review and do a presentation (of 15 minutes) about the famous mathematicians involved in the area of study	4 Hours	Literature Review/Flipped Learning	8th Week onwards

III. Assignments and Seminars

Assignments

No	Topics	Activity	Submission Deadlines	
Assignment 1	Assignment on given topic	Preparation of assignment	15th August 2018	Submit the assignment before 25th August 2018
Assignment 2	Assignment on given topic	Preparation of assignment	25th September 2018	Submit the assignment before 5th October 2018

Note: Failure to submit the assignment on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.

IV. Attendance (one component in class participation):

90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	**Not eligible for appearing for ESE**

V. Required reading:

- H. L. Royden, P.M. Fitzpatrick, Real Analysis Third Edition, Prentice Hall of India Private Limited
- G. de Barra : Measure Theory and integration , New Age International (P) Ltd., New DelhiNew Age International (P) Ltd., New Delhi,
- Halmos P.R, Measure Theory, D.vanNostrand Co.
- P.K. Jain and V.P. Gupta, Lebesgue Measure and Integration, New Age International (P) Ltd., New Delhi, 1986(Reprint 2000).
- R.G. Bartle, The Elements of Integration, John Wiley & Sons, Inc New York, 1966.

St. Albert's College (Autonomous)

PMT1CRT04 GRAPH THEORY

Course Instructor

Name	Sem, Programme& Batch	Email
Jeema Jose	Sem I MSc ,2018-19	jeemajose@alberts.edu.in

I. Duration of Course:

No	Activity	Duration
1	Contact hours	90(Including assignments)
2	Assessment (CAE & ESE)	6
	Total	96
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	6

II.Course Objectives:

- Able to define the basic concepts of graphs, directed graphs, and weighted graphs.
- Defines a graph, identifying edges and vertices.
- Finds the degree of a vertex.
- Able to define the properties of bipartite graphs, particularly in trees.
- Defines bipartite graphs.
- Lists basic properties of trees.
- Expresses and prove Cayley Theorem.
- Explains basic results about colouring vertices.
- Defines chromatic polynomials.
- Defines Eulerian graph.
- Defines Hamiltonian graphs.
- Explains basic results related with Eulerian and
- Hamiltonian graphs.
- Explains planar graph notion.
- Proves Euler formula.
- Explains dual graphs.

III. Course Delivery Plan

St. Albert's College (Autonomous)

PMT1CRT04 GRAPH THEORY

Course Instructor

Name	Sem, Programme& Batch	Email
Jeema Jose	Sem I MSc ,2018-19	jeemajose@alberts.edu.in

I. Duration of Course:

No	Activity	Duration
1	Contact hours	90(Including assignments)
2	Assessment (CAE & ESE)	6
	Total	96
	Remedial Sessions/ Peer Tutoring/Tutorials (need based & Optional)	6

II.Course Objectives:

- Able to define the basic concepts of graphs, directed graphs, and weighted graphs.
- Defines a graph, identifying edges and vertices.
- Finds the degree of a vertex.
- Able to define the properties of bipartite graphs, particularly in trees.
- Defines bipartite graphs.
- Lists basic properties of trees.
- Expresses and prove Cayley Theorem.
- Explains basic results about colouring vertices.
- Defines chromatic polynomials.
- Defines Eulerian graph.
- Defines Hamiltonian graphs.
- Explains basic results related with Eulerian and
- Hamiltonian graphs.
- Explains planar graph notion.
- Proves Euler formula.
- Explains dual graphs.

III. Course Delivery Plan

This course is a course requiring lot of student centric learning processes. The teaching methods include lectures, discussions, assignments, Seminars etc.

Topics	Session No & Date(s)	Methodology and Duration
These are the topics to be covered in the modules		
Introduction, Basic concepts. Sub graphs. Degrees of vertices. Paths and Connectedness, Automorphism of a simple graph, line graphs, Operations on graphs, Graph Products. Directed Graphs : Introduction, basic concepts and tournaments. Connectivity : Introduction, Vertex cuts and edge cuts, connectivity and edge connectivity, blocks.	20/06/2018 TO 19/07/2018	Class exercises Lectures Discussions Illustration with examples
Trees; Introduction, Definition, characterization and simple properties, centres and cancroids, counting the number of spanning trees, Cayley's formula. Applications	20/07/2018 TO 29/08/2018	Lectures, Discussions, Class exercises
Eulerian and Hamiltonian Graphs: Introduction, Eulereian graphs, Hamiltonian Graphs, Hamiltonian around' the world' game Graph Colorings: Introduction, Vertex Colorings, Applications of Graph Coloring, Critical Graphs, Triangle free graphs.Brooks theorem.	30/08/ 2018 TO 27/09/2018	GD, Lectures, Class exercises, Assignment.
Edge coloring and Planarity:Planar and Nonplanar Graphs, Euler Formula and Its Consequences, K5 and K 3,3 are Nonplanar Graphs, Dual of a Plane Graph, The Four-Color Theorem and the Heawood Five-Color Theorem	28/09/2018 TO 30/10/2018	GD, Lectures, Class exercises, Student Presentations

II. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time

St Albert's College Ernakulam-682 018

Illustrations with examples of theorems and concepts	5 Hours	Experiential learning	1st Week

III. Assignments and Seminars

Assignments

No	Topics	Activity	Submission Deadlines	
Assignment	Assignment on given topic	Preparation of assignment	30th September 2018	Submit the assignment book before 3 pm.
Seminar	PowerPoint presentation on given topic	PowerPoint Presentation for a presentation of 30 minutes duration	**28/09/2018 to 30/10/2018**	Submit the report before 30 th October 2018.

Note: Failure to submit the assignment on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.

IV. Attendance (one component in class participation):

90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	**Not eligible for appearing for ESE**

V. Required reading:

1. R. Balakrishnan and K. Ranganathan , A Text book of Graph Theory, Second edition Springer
2. John Clark and Derek Allan Holton, A First Look at Graph Theory, Allied Publishers.
3. Douglas B West, Introduction to Graph Theory, Prentice Hall of India.
4. Sheldon Axler, Linear algebra done right, Second edition ,Springer.

St. Albert's College (Autonomous)

PMT1CRT05 – COMPLEX ANALYSIS

I. Course Instructor

Name	Sem, Programme& Batch	Email
GOLDA MARY JOSEPH	Sem 1, M.Sc. Mathematics, 2018-19	goldamary@alberts.edu.in

II. Duration of Course:

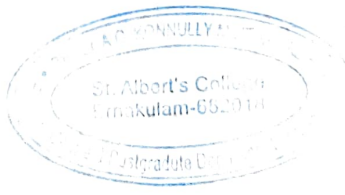
No	Activity	Duration
1	Contact hours	75
2	Assessment (CAE & ESE)	7
	Total	82
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	10

III. Course Objectives:

- Define analytic function and carry out conformal mappings with complex numbers.
- Evaluate a contour integral using fundamental theorem in complex integration and Cauchy's integral formula.
- Compute the residue of a function and use the Cauchy's theorem and Residue theorem to evaluate a contour integral.
- Enable the students to appreciate and critically evaluate the analytic, harmonic functions

IV. Course Delivery Plan

Topics	Session No & Date(s)	Methodology and Duration
Topics	Session No & Date(s)	Methodology and Duration
These are the topics to be covered in the modules		
Analytic functions as Mappings: Arcs and closed curves. Analytic functions in regions. Conformal mappings. Length and area Linear transformations , The cross ratio, Symmetry, Oriented circles, Families of circles.	20/06/18 to 23/07/18	Class exercises Lectures



Elementary conformal mappings: the use of level curves, a survey of elementary mappings, elementary Riemann Surfaces		
Fundamental theorems on complex integration: line integrals, rectifiable arcs, line integrals as functions of arcs, Cauchy's theorem for a rectangle, Cauchy's theorem in a disk, Cauchy's integral formula: the index of a point with respect to a cloud curve, the integral formula. Higher derivatives	24/07/18 to 09/08/18	Class exercises Lectures
Local properties of analytical functions: removable singularities, Taylor's theorem, zeroes and poles, Weirstrass Theorem on essential singularity, the local mapping, the maximum principle The general form of Cauchy's theorem: chains and cycles, simple connectivity, homology, general statement of Cauchy's theorem, proof of Cauchy's theorem, locally exact differentiation, multiply connected regions	10/08/18 to 29/09/18	Class exercises Lectures
Calculus of Residues: the residue theorem, the argument principle, evaluation of definite integrals. Harmonic Functions – Definitions and Basic Properties, The Mean-Value Property, Poisson's Formula, Schwarz's Theorem, The Reflection Principle.	01/10/18 to 24/10/18	Class exercises Lectures,

V. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time
Google Search and prepare a brief report on Steriographic Projection and its applications, also prepare a model(Group activity)	4 days	Experimental Learning	2nd week of August
Google Search and prepare a brief report on the topic 'Riemann Surfaces' Source : https://nptel.ac.in/courses/111/106/111106044/	4 days	Self learning	4th week of September

VI. Assignments and Seminars

No	Topics	Activity	Submission Deadlines	
Assignment	Assignment on given topic	Preparation of assignment	Assignment 1 : 15th July 2018	Submit the assignment book on or before the due date

			Assignment 2 : 20th August 2018 Assignment 3 : 10th September 2018	
Seminar	Presentation on given topic	Presentation of 15-30 minutes duration	Thursday's of August, September, & October & of Course	Submit the assignment 2 days before the seminar

Note: Failure to submit the assignment on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.

VII. Attendance (one component in class participation):

95-100%	5
90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	**Not eligible for appearing for ESE**

VIII. Required reading:

1. Lars V. Ahlfors, Complex Analysis, Third edition, McGraw Hill Internationals
2. Chaudhary B., The Elements of Complex Analysis, Wiley Eastern.
3. Cartan H., Elementary theory of Analytic Functions of one or several variable, Addison Wesley, 1973.
4. Conway J. B., Functions of one complex variable, Narosa publishing.
5. Lang S., Complex Analysis, Springer.
6. H. A. Priestly, Introduction to Complex Analysis, Clarendon Press, Oxford, 1990.

St. Albert's College (Autonomous)

PMT2CRT01 REAL ANALYSIS

Course Instructor

Name	Sem, Programme& Batch	Email
Jeema Jose	Sem II M.Sc., 2018-19	jeemajose@alberts.edu.in

I. Duration of Course:

No	Activity	Duration
1	Contact hours	90(Including assignments)
2	Assessment (CAE & ESE)	6
	Total	96
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	6

II.Course Objectives:

- Define and recognize the basic properties of real numbers
- Define and recognize the series of real numbers and convergence.
- Have the knowledge of real functions-limits of functions and their properties.
- Studying the notion of continuous functions and their properties
- Recognize the Riemann integrable real functions and its related theorems
- Define the real numbers, least upper bounds, and the triangle inequality.
- Define functions between sets; equivalent sets; finite, countable and uncountable sets. Recognize convergent, divergent, bounded, Cauchy and monotone sequences.

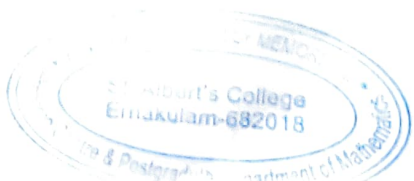
II. Course Delivery Plan

This course is a course requiring lot of student centric learning processes. The teaching methods include lectures, discussions, assignments, Seminars etc.

Topics	Session No & Date(s)	Methodology and Duration
These are the topics to be covered in the modules		
Introduction, properties of monotonic functions, functions of bounded variation, total variation, additive property of total variation, total variation on(a, x) as a functions of x, functions of bounded variation expressed as the difference of increasing functions, continuous functions of bounded variation, curves and paths, rectifiable path and arc length, additive and continuity properties of arc length, equivalence of paths, change of parameter.	26/11/2018 TO 14/12/2018	Class exercises Lectures Discussions Illustration with examples
Definition and existence of the integral, properties of the integral, integration and differentiation, integration of vector valued functions.	17/12/2018 TO 18/01/2019	Lectures, Discussions, Class exercises Analysing integration and differentiation using GEOGEBRA
Discussion of main problem, Uniform convergence, Uniform convergence and Continuity, Uniform convergence and Integration, Uniform convergence and Differentiation	21/01/ 2019 TO 20/02/2019	GD, Lectures, Class exercises
Equicontinuous families of functions, the Stone - Weierstrass theorem,Power series, the exponential and logarithmic functions, the trigonometric functions, the algebraic completeness of complex field.	21/02/2019 TO 28/03/2019	GD, Lectures, Class exercises Visualisation of examples using GEOGEBRA

III. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time
Visualisation of integration and differentiation concepts using GEOGEBRA	3 hours	Experiential Learning	3rd Week
Illustrations with examples of theorems and concepts	5 Hours	Experiential learning	2nd Week



IV. Assignments and Seminars

Assignments

No	Topics	Activity	Submission Deadlines	
Assignment 1	Establishing functions of Bounded variation	Preparation of assignment Referring text book and	28th Dec 2018	Submit the assignment to Google Classroom before 30th Dec
Assignment 2	Establishing uniform convergence of sequences		20th Feb 2019	Submit the assignment to Google Classroom before 21st Feb
Seminar	PowerPoint presentation on given topic	PowerPoint Presentation for a presentation of 30 minutes duration	**01/03/2019 to 28/03/2019**	Submit the report before 1 st April 2019.

Note: Failure to submit the assignment on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.

V. Attendance (one component in class participation):

90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	**Not eligible for appearing for ESE**

VI. Required reading:

1. Tom Apostol, Mathematical Analysis (Second edition), Narosa Publishing House. 2.
2. Walter Rudin, Principles of Mathematical Analysis (Third edition), McGraw Hill Book Company, International Editions.
3. Robert G. Bartle Donald R. Sherbert, Introduction to Real Analysis, 4th Edition, John

Wiley and Sons, New York.
4. Gerald B. Folland, Real Analysis: Modern Techniques and Their Applications, 2 nd Edition, WeilyInterscience Publication, John Wiley and Sons, New York.
5. Royden H.L, Real Analysis, 2nd edition, Macmillan, New York.

St. Albert's College (Autonomous)

PMT26RT01

MATHEMATICS ADVANCED TOPOLOGY

Course Instructor

Name	Sem, Programme& Batch	Email
Jeema Jose	Sem II MSc ,2018-19	jeemajose@alberts.edu.in

I. Duration of Course:

No	Activity	Duration
1	Contact hours	90(Including assignments)
2	Assessment (CAE & ESE)	7
	Total	**97**
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	**6**

Topics	Session No & Date(s)	Methodology and Duration
These are the topics to be covered in the modules		
Urysohn Characterisation of Normality – Tietze Characterisation of Normality. Products and co-products: Cartesian products of families of sets – Product Topology – Productive properties	26/11/2018 TO 21/12/2018	Class exercises Lectures Discussions Videos Illustration with examples
Embedding and Metrisation – Evaluation Functions in to Products, Embedding Lemma and Tychnoff Embedding, The Urysohn Metrisation Theorem.	31/12/2018 TO 21/01/2019	Lectures, Discussions, Class exercises
Nets and Filters: Definition and Convergence of Nets, Topology and Convergence of Nets, Filters and their Convergence, Ultra filters and Compactness.	22/01/ 2019 TO 18/02/2019	GD, Lectures, Class exercises, Presentations by students
Compactness: Variations of compactness – local compactness – compactification.	19/02/2019 TO	GD, Lectures, Class

22/3/2019 exercises

Visualisation of examples using GEOGEBRA

I. Course Objectives:

- Generalization of concepts like continuity
- Generalizations of theorems
- Distinguishing spaces up to homeomorphisms
- Work with topological definitions and theorems
- Produce examples and counter examples that illustrate why theorem hypotheses are necessary or why a statement is true
- Draw pictures to represent topological ideas
- Formulate conjectures about topological concepts and test these conjectures
- Prove topological statements
- Use homeomorphisms

II. Course Delivery Plan

The teaching methods include lectures, discussions, assignments, Seminars etc.

III. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time
Visualisation of topologically equivalent objects using videos	1 Hour	Experiential Learning	1st Week
Illustrations with examples of theorems and concepts	5 Hours	Experiential learning	2nd Week
Visualisation of examples using GEOGEBRA	3 hrs	Experiential learning	6th week

IV. Assignments and Seminars

Assignments

No	Topics	Activity	Submission Deadlines	
Assignment	Assignment on given topic	Preparation of assignment	18th Dec 2018	Submit the assignment to before 20th Dec
Seminar	PowerPoint presentation on given topic	PowerPoint Presentation for a presentation of 30 minutes duration	**14/01/2019 to 12/02/2019**	Submit the report before 12 th January

St. Albert's College Ernakulam-682018

re to submit the assignment on the date mentioned will result in 0 marks for the assignment
for extension of dates for submission not entertained

Attendance (one component in class participation):

90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	**Not eligible for appearing for ESE**

VI. Required reading:

1. K.D Joshi , Introduction to General Topology , Wiley Eastern Ltd, 1984
2. George F. Simmons, Introduction to Topology and Modern Analysis, McGrawHill Book Company,1963
3. I.M. Singer &J.A. Thorpe ,Lecture Notes on Elementary Topology &Geometry, Springer Verlag 2004
4. Munkres J.R, Topology-A First Course, Prentice Hall of India Pvt. Ltd., New Delhi, 2000.
5. J.L Kelley, General Topology, Van Nostrand, Reinhold Co., New York, 1995.
6. Stephen Willard, General Topology, Addison-Wesley.
7. Dugundji, Topology, Universal Book Stall, New Delhi

St. Albert's College (Autonomous)

PMT2CRT03 – ADVANCED COMPLEX ANALYSIS

I. Course Instructor

Name	Sem, Programme& Batch	Email
GOLDA MARY JOSEPH	Sem 2, M.Sc. Mathematics, 2018-19	goldamary@alberts.edu.in

II. Duration of Course:

No	Activity	Duration
1	Contact hours	90
2	Assessment (CAE & ESE)	7
	Total	97
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	7

III. Course Objectives:

- Define the concept of Harmonic functions
- Present the central ideas in the solution of Dirichlet's problem
- Express concepts of convergence sequences and series of the complex functions.
- Express concepts of absolute and uniform convergence of power series.
- Define the concepts of Taylor and Laurent series.
- Demonstrate capacity for mathematical reasoning through analyzing, proving and explaining concepts from complex analysis

IV. Course Delivery Plan

Topics	Session No & Date(s)	Methodology and Duration
Topics	Session No & Date(s)	Methodology and Duration
These are the topics to be covered in the modules		
Elementary theory of power series: Sequences, Series, Uniform Convergence, Power Series, Abel's Limit Theorem Power Series Expansions – Weierstrass's theorem, The Taylor Series, The Laurent Series Partial Fractions and Factorization –	26/11/18 to 21/12/18	Class exercises Lectures

St. Albert's College Ernakulam-682018

rtial Fractions, Infinite Products, anonical Products, The Gamma Function. Entire Functions – Jensen's Formula, Hadamard's Theorem The Riemann Zeta Function – The Product Development, The Extension of (s) to the Whole Plane, The Functional Equation, The Zeroes of the Zeta Function Normal Families – Normality and Compactness, Arzela's Theorem	31/12/18 to 30/01/19	Class exercises Lectures
The Riemann Mapping Theorem – Statement and Proof, Boundary Behaviour, Use of the Reflection Principle, Analytic Arcs Conformal mappings of polygons: the behavior of an angle, the Schwarz-Christoffel formula A Closer look at harmonic functions: Functions with mean value property, Harnack's principle The Dirichlet problem: Sub harmonic functions, solution of Dirichlet problem	31/01/19 to 28/02/19	Class exercises Lectures
Elliptic functions: Simply periodic functions, the representation of exponentials, the Fourier Development, Functions of finite order The Weierstrass's Theory – The Weierstrass's - function, The Differential Equation Analytic Continuation: the Weierstrass theorem, Germs and Sheaves, sections and Riemann surfaces, Analytic continuation along arcs, homotopic curves	01/03/19 to 22/03/19	Class exercises Lectures,

V. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time
Analyze the geometrical aspects of uniform convergence – Google Search and prepare a brief report	4 days	Self Learning	2nd week of February

Self learning			2nd week of March
Google Search and prepare a brief report on the topic 'Doubly periodic functions and their graphs'	4 days		

VI. Assignments and Seminars

Assignments

The following Assignment needs to be submitted to Google Classroom. Both the assignments & presentation are individual assignments.

No	Topics	Activity	Submission Deadlines	
Assignment	Assignment on given topic	Preparation of assignment	Assignment 1 : 9th December 2018 Assignment 2 : 20th January 2019 Assignment 3 : 6th February 2019	Submit the assignment book on or before the due date
Seminar	Presentation on given topic	Presentation of 15-30 minutes duration	Tuesday's of January. February & March of Course	Submit the report 2 days before the seminar

Note: Failure to submit the assignment on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.

VII. Attendance (one component in class participation):

95-100%	5
90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	Not eligible for appearing for ESE

VIII. Required reading:

1. Chaudhary B., The Elements of Complex Analysis, Wiley Eastern.
2. Cartan H., Elementary theory of Analytic Functions of one or several variable, Addison Wesley.

St. Albert's College (Autonomous)

PMT2CRT04 – PARTIAL DIFFERENTIAL EQUATIONS

I. Course Instructor

Name	Sem, Programme & Batch	Email
Divya Mary Daise S	Sem 2, M.Sc. Mathematics, 2018-19	divyamary@alberts.edu.in

II. Duration of Course:

No	Activity	Duration
1	Contact hours	75
2	Assessment (CAE & ESE)	5
	Total	**80**
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	**10**

III. Course Objectives:

- To learn about Pfaffian differential forms and equations and Solution of Pfaffian differential equations in three variables
- To understand about Linear equations of first order and their solutions
- To study about Nonlinear partial differential equation of the first order and their solutions using Charpits Method and Jacobi's Method
- To learn more about Laplace Equations and its solutions

IV. Course Delivery Plan

Topics	**Session No & Date(s)**	**Methodology and Duration**
Topics	Session No & Date(s)	Methodology and Duration
These are the topics to be covered in the modules Module 1: Methods of solutions of dx/P = dy/Q = dz/R. Orthogonal trajectories of a system of curves on a surface. Pfaffian differential forms and equations. Solution of Pfaffian differential equations in three variables, Partial differential equations. Origins of first order partial differential equation. Linear equations of first order. Integral surfaces passing through a given curve. Surfaces orthogonal to a given system of surfaces.	26/11/18 to 21/12/18	Lectures, Discussions, Assignments, Class exercises

Rev. Dr. A.O. KONNULLY MEMORIYAL
St. Albert's College
Ernakulam-682018
Research Centre & Postgraduate Department

Module 2: Nonlinear partial differential equation of the first order . Compatible systems of first order equations . Charpits Method. Special types of first order equations. Solutions satisfying given conditions. Jacobi' s method	31/12/18 to 30/01/19	Lectures, Discussions, Assignments, Class exercises
Module 3: The origin of second order equations. Linear partial differential equations with constant coefficients. Equations with variable coefficients. Characteristic Curves of 2nd order equations	31/01/19 to 28/02/19	Lectures, Discussions, Assignments, Class exercises
Module 4: Solution of linear Hyperbolic Equations. Separation of variables. Non linear equations of the second order . Elementary solutions of Laplace equation. Families of equipotential surfaces. Boundary Value Problems.	01/03/19 to 22/03/19	Lectures, Student Presentations, Discussions

V.

Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time
Group Discussion and presentation of challenging exercises from the text book	5 Hour	Research Based Learning	5th Week onwards
Journey to Origin - Do literature review and do a presentation (of 15 minutes) about the origin and applications of the famous PDEs.	4 Hours	Literature Review/Flipped Learning	8th Week onwards

VI. Assignments and Seminars

No	Topics	Activity	Submission Deadlines	
Assignment 1	Assignment on given topic	Preparation of assignment	5th December 2018	Submit the assignment before 15th December 2018
Assignment 2	Assignment on given topic	Preparation of assignment	5th February 2019	Submit the assignment before 15th February 2019

Note: Failure to upload the assignment to on the date mentioned will result in 0 marks for the
t. Requests for extension of dates for submission not entertained.

VII. Attendance (one component in class participation):

95-100%	5
90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	Not eligible for appearing for ESE

VIII. Required reading:

- Ian Sneddon , Elements of Partial Differential Equations, Mc Graw Hill Book Company
- Phoolan Prasad and Renuka Ravindran, Partial Differential Equations, New Age International
- K Sankara Rao, Introduction to Partial Differential Equations, Prentice Hall of India
- E T Copson, Partial Differential Equations, S Chand and Co

St. Albert's College (Autonomous)

PMT3CRT02 - FUNCTIONAL ANALYSIS

Course Instructor

Name	Sem, Programme& Batch	Email
Dr. Shery Fernandez,	Sem 3, M Sc Mathematics, 2018-19	sheryfernandez@yahoo.co.in

I. Duration of Course:

No	Activity	Duration
1	Contact hours	85
2	Assessment (CAE & ESE)	5
	Total	90
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	5

II.Course Objectives:

- To familiarise the concepts of normed spaces and Banach Spaces
- To learn about Linear Operators, Bounded Linear Operators, Linear Functionals, Bounded Linear Functionals and Dual Spaces
- To know about Innerproduct Spaces and Hilbert Spaces and the well known results like Schwarz Inequality, Bessel's Inequality, Projection Theorem, Riesz Representation etc
- To learn about the Hilbert Adjoint Operators and Adjoint Operators and the well known Hahn-Banach Theorem
- To understand about some reflexive spaces, category theorem and uniform boundedness theorem

III. Course Delivery Plan

The teaching methods include lectures, discussions, assignments, Seminars etc.

Topics	Session No & Date(s)	Methodology and Duration
These are the topics to be covered in the modules		
Module 1: Vector Space, Normed Space, Banach space, Further Properties of Normed Spaces, Finite Dimensional Normed spaces and Subspaces, Compactness and Finite Dimension, Linear Operators, Bounded and Continuous Linear Operators	01-06-18 to 13-07-18	Lectures, Discussions, Assignments, Class exercises
Module 2: Linear Functionals, Linear Operators and Functionals on Finite dimensional spaces, Normed spaces of operators, Dual space, Inner Product Space, Hilbert space, Further properties of Inner Product Space	16-07-2018 to 31-07-2018	Lectures, Discussions, Assignments, Class exercises
Module 3: Orthogonal Complements and Direct Sums, Orthonormal sets and sequences, Series related to Orthonormal sequences and sets, Total Orthonormal sets and sequences, Representation of Functionals on Hilbert Spaces, Hilbert-Adjoint Operator, Self-Adjoint, Unitary and Normal Operators	03-08-2018 to 11-09-2018	Lectures, Discussions, Assignments, Class exercises
Module 4: Zorn's lemma, Hahn- Banach theorem, Hahn- Banach theorem for Complex Vector Spaces and Normed Spaces, Adjoint Operators, reflexive spaces, category theorem and uniform boundedness theorem	12-09-2018 to 29-09-2018	Lectures, Student Presentations, Discussions

II. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time
Group Discussion and presentation of challenging exercises from the text book	5 Hour	Research Based Learning	5th Week Onwards

II. Assignments and Seminars

Assignments:

No	Topics	Activity	Submission Deadlines	
Assignment 1	Assignment on given topic	Preparation of assignment	5th July 2018	Submit the assignment before 10th July 2018
Assignment 2	Assignment on given topic	Preparation of assignment	5th September 2018	Submit the assignment before 15th September 2018

Note: Failure to submit the assignments of the four mentioned will result in 1 mark for the assignment. Reasons for absence of three for submission not entertained.

IV. Attendance (one component in class participation):

91-95%	5
85-90%	3
81-85%	2
75-80%	1
<75	Not eligible for appearing for ESE

V. Required reading:

Erwin Kreyszig, Introductory Functional Analysis with applications, John Wiley and sons, New York

Limaye, B V, Functional Analysis, New Age International (P) LTD, New Delhi, 2004

Simmons, G F, Introduction to Topology and Modern Analysis, McGraw –Hill, New York, 1963

Siddiqi, A H, Functional Analysis with Applications, Tata McGraw –Hill, New Delhi, 1989

St. Albert's College (Autonomous)

PMT3CRT03 – DIFFERENTIAL GEOMETRY

I. Course Instructor

Name	Sem, Programme & Batch	Email
SABU M C	Sem 3, M.Sc. Mathematics, 2018-19	sabuchacko@alberts.edu.in

II. Duration of Course:

No	Activity	Duration
1	Contact hours	72
2	Assessment (CAE & ESE)	18
	Total	90
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	4

III. Course Objectives:

- Understand the basic concepts of surfaces
- Explain the significance of gradient and tangent
- Make use of properties geodesics
- Solve the problems related to parallel transport
- Evaluate curvature, arc length
- Determine whether a given number is prime or not

IV. Course Delivery Plan

Topics	Session No & Date(s)	Methodology and Duration
Topics	Session No & Date(s)	Methodology and Duration
These are the topics to be covered in the modules Graphs and level sets, vector fields, the tangent space, surfaces, vector fields on surfaces, orientation	01-06-18 to 28-06-18	Class exercises Lectures
The Gauss map, geodesics, Parallel transport	29-06-2018 to 31-07-2018	Class exercises Lectures

The Weingarten map, curvature of plane curves, Arc length and line integrals	01-08-2018 to 10-09-2018	Class exercises Lectures
Curvature of surfaces and Parametrized surfaces	11-09-2018 to 22-10-2018	Class exercises Lectures

V. Assignments and Seminars

Assignments

The following Assignment needs to be submitted to Google Classroom. Both the assignments & presentation are individual assignments.

No	Topics	Activity	Submission Deadlines	
Assignment	Assignment on given topic	Preparation of assignment	Assignment 1 : 1st August 2018 Assignment 2 : 21st August 2018 Assignment 3 : 24th September 2018	Submit the assignment book on or before the due date
Seminar	PowerPoint presentation on given topic	PowerPoint Presentation for a presentation of 10 - 15 minutes duration	August & September of Course	Submit the report 2 days before the seminar

Note:. Failure to submit the assignment on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.

VI. Attendance (one component in class participation):

95-100%	5
90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	**Not eligible for appearing for ESE**

VII. Required reading:

1. John A. Thorpe, Elementary Topics in Differential Geometry

St. Albert's College (Autonomous)

PMT3CRT04 – NUMBER THEORY AND CRYPTOGRAPY

I. Course Instructor

Name	Sem, Programme& Batch	Email
GOLDA MARY JOSEPH	Sem 3, M.Sc. Mathematics,2018-19	goldamary@alberts.edu.in

II. Duration of Course:

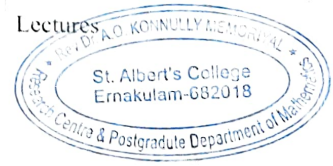
No	Activity	Duration
1	Contact hours	82
2	Assessment (CAE & ESE)	8
	Total	90
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	3

III. Course Objectives:

- Understand the basic concepts of number theory and cryptography
- Explain the significance of time estimate
- Make use of properties of congruence to compute solutions of problems
- Solve the problems related to factoring
- Evaluate discrete log using Silver Pohlig Hellman algorithm
- Determine whether a given number is prime or not

IV. Course Delivery Plan

Topics	**Session No & Date(s)**	**Methodology and Duration**
Topics	Session No & Date(s)	Methodology and Duration
These are the topics to be covered in the modules		
Some topics in Elementary Number Theory: Time estimates for doing arithmetic, divisibility and the Eucledian Algorithm, congruences, Some applications to factoring	01-06-18 to 13-07-18	Class exercises Lectures
Finite Fields and Quadratic Residues : Finite Fields, Quadractic Residues and reciprocity	16-07-2018 to 31-07-2018	Class exercises Lectures



Public Key: The idea of public key cryptography, RSA, Discrete log	03-08-2018 to 11-09-2018	Class exercises Lectures
Primality and Factoring: Pseudo primes, The rho method, Fermat factorisation and factor bases, the quadratic sieve method	12-09-2018 to 29-09-2018	Class exercises Lectures

V. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time
''CRACKING SECRET KEYS''	2 DAYS	Experimental Learning	2nd week of July
PREPARE A REPORT ON RSA CRYPTOSYSTEMS SOURCE: https://nptel.ac.in/courses/106/107/106107155/	2 DAYS	Self Learning	2nd week of August

VI. Assignments and Seminars

Assignments

The following Assignment needs to be submitted to Google Classroom. Both the assignments & presentation are individual assignments.

No	Topics	Activity	Submission Deadlines	
Assignment	Assignment on given topic	Preparation of assignment	Assignment 1 : 9th July 2018 Assignment 2 : 22nd August 2018 Assignment 3 : 6th Sptember 2018	Submit the assignment book on or before the due date
Seminar	PowerPoint presentation on given topic	PowerPoint Presentation for a presentation of 10 - 15 minutes duration	Tuesday's of August & September of Course	Submit the report 2 days before the seminar

Note:. Failure to submit the assignment on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.

St Albert's College Ernakulam-682018

VII. Attendance (one component in class participation):

95-100%	5
90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	Not eligible for appearing for ESE

VIII. Required reading:

1. Niven, H S Zuckerman & H. L. Montgomery, An Introduction to the Theory of Numbers John Wiley & Sons, New York, 5th Edition.
2. Ireland and Rosen, A Classical Introduction to Modern Number Theory, Springer, 2nd edition, 1990
3. David Burton, Elementary Number Theory and its applicaions, Mc-Graw-Hill Education
4. Alfred J. Menezes, Paul C van Oorschot and Scott A Vanstone, Handbook of Applied Cryptography, CRC Press, 1996
5. Douglas R Stinson, Cryptography Theory and Practice, Chapman & Hall, 2nd Edition.
6. Victor Shoup, A computation Introduction to Number Theory and Algebra, Cambridge University Press 2005

St. Albert's College (Autonomous)

PMT3CRT05 OPTIMIZATION TECHNIQUES

Course Instructor

Name	Sem, Programme& Batch	Email
Dr. Sabu M.C	Sem III MSc ,2018-19	sabuchacko@alberts.edu.in

I. Duration of Course:

No	Activity	Duration
1	Contact hours	90(Including assignments)
2	Assessment (CAE & ESE)	6
	Total	96
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	6

II.Course Objectives:

- Learn classical optimization techniques and numerical methods of optimization.
- Know the basics of different evolutionary algorithms.
- Explain Integer programming techniques and apply different optimization techniques to solve various models arising from engineering areas.
- Ability to apply the theory of optimization methods and algorithms to develop and for solving various types of optimization problems
- Ability to go in research by applying optimization techniques in problems of Engineering and Technology.

III. Course Delivery Plan

This course is a course requiring lot of student centric learning processes. The teaching methods include lectures, discussions, assignments, Seminars etc.

Topics	Session No & Date(s)	Methodology and Duration
These are the topics to be covered in the modules		
Simplex Method, Canonical form of equations, Simplex Method (Numerical Example), Simplex Tableau, Finding the first BFS and artificial variables, Degeneracy, Simplex multipliers, Revised simplex method, Duality in LPP, Duality theorems, Applications of Duality, Dual simplex method, Summery of simplex methods	01/06/2018 TO 03/07/2018	Class exercises Lectures Discussions Illustration with examples
I.L.P in two dimensional space – General I.L.P. and M.I.L.P problems – cutting planes – remarks on cutting plane methods – branch and bound method – examples –general description – the 0 – 1 variable	04/07/2018 TO 08/08/2018	Lectures, Discussions, Class exercises
Goal programming. Graphs- definitions and notation – minimum path problem – spanning tree of minimum length – problem of minimum potential difference – scheduling of sequential activities – maximum flow problem – duality in the maximum flow problem – generalized problem of maximum flow.	10/08/ 2018 TO 10/09/2018	GD, Lectures, Class exercises, Assignment.
Basic concepts – Taylor's series expansion – Fibonacci Search - golden section search– Hooke and Jeeves search algorithm – gradient projection search – Lagrange multipliers – equality constraint optimization, constrained derivatives – non-linear optimization: Kuhn-Tucker conditions – complimentary Pivot algorithms.	11/09/2018 TO 01/10/2018	GD, Lectures, Class exercises, Student Presentations

II. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time
Illustrations with examples of theorems and concepts	5 Hours	Experiential learning	1st Week

III. Assignments and Seminars

Assignments

No	Topics	Activity	Submission Deadlines	
Assignment	Assignment on given topic	Preparation of assignment	10th August 2018	Submit the assignment book before 3 pm.
Seminar	PowerPoint presentation on given topic	PowerPoint Presentation for a presentation of 30 minutes duration	11/09/2018 TO 01/10/2018	Submit the report before 4th September 2018.

Note: Failure to submit the assignment on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.

IV. Attendance (one component in class participation):

90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	**Not eligible for appearing for ESE**

V. Required reading:

1. K.V. Mital and C. Mohan, Optimization Methods in Operation Research and Systems Analysis, 3rd edition.
2. Ravindran, Philips and Solberg. Operations Research Principle and Practice, 2nd edition, John Wiley and Sons.
3. S.S. Rao, Optimization Theory and Applications, 2 nd edition, New Age International Pvt.
4. J.K. Sharma, Operations Research: Theory and Applications, 3rd edition, Macmillan India Ltd.
5. Hamdy A. Thaha, Operations Research – An Introduction, 6 th edition, Prentice Hall of India Pvt. Ltd

St. Albert's College (Autonomous)

PMT4CRT01 – SPECTRAL THEORY

I. Course Instructor

Name	Sem, Programme & Batch	Email
Dr. Shery Fernandez	Sem 4, M.Sc. Mathematics, 2018-19	sheryfernandez@yahoo.co.in

II. Duration of Course:

No	Activity	Duration
1	Contact hours	75
2	Assessment (CAE & ESE)	5
	Total	80
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	10

III. Course Objectives:

- Define and thoroughly explain Banach and Hilbert spaces and self-adjoint operators
- Independently prove and thoroughly explain central theorems like Category Theorem, Uniform Boundedness Theorem, Open Mapping Theorem, Closed Graph Theorem, Banach Fixed Point Theorem,
- Define and thoroughly explain the spectra of linear operators in finite dimensional normed spaces.
- Define and thoroughly explain the spectral properties of bounded linear operators, compact linear operators, bounded self adjoint linear operators and projection operators.

IV. Course Delivery Plan

Topics	**Session No & Date(s)**	**Methodology and Duration**
Topics **These are the topics to be covered in the modules**	Session No & Date(s)	Methodology and Duration
Module 1: Strong and Weak Convergence, Convergence of Sequences of Operators and Functionals, Open Mapping Theorem, Closed Linear Operators, Closed Graph Theorem, Banach Fixed point theorem	05-11-18 to 10-12-18	Lectures, Discussions, Assignments, Class exercises

Module 2: Spectral theory in Finite Dimensional Normed Spaces, Basic Concepts, Spectral Properties of Bounded Linear Operators, Further Properties of Resolvent and Spectrum, Use of Complex Analysis in Spectral Theory, Banach Algebras, Further Properties of Banach Algebras	11-12-2018 to 10-01-2019	Lectures, Discussions, Assignments, Class exercises
Module 3: Compact Linear Operators on Normed spaces, Further Properties of Compact Linear Operators, Spectral Properties of compact Linear Operators on Normed spaces, Further Spectral Properties of Compact Linear Operators, Unbounded Linear operators and their hilbert adjoint operators, symmetric and self adjoint linear operators	11-01-2019 to 31-01-2019	Lectures, Discussions, Assignments, Class exercises
Module 4: Spectral Properties of Bounded Self adjoint linear operators, Further Spectral Properties of Bounded Self Adjoint Linear Operators, Positive Operators, Projection Operators, Further Properties of Projections	01-02-2019 to 25-02-2019	Lectures, Student Presentations, Discussions

V.

Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time
Group Discussion and presentation of challenging exercises from the text book	5 Hour	Research Based Learning	5th Week onwards

VI. Assignments and Seminars

No	Topics	Activity	Submission Deadlines	
Assignment 1	Assignment on given topic	Preparation of assignment	5th February 2018	Submit the assignment before 15th February 2018
Assignment 2	Assignment on given topic	Preparation of assignment	13th March 2018	Submit the assignment before 23th March 2018

Note: Failure to upload the assignment to on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.

Rev Dr A.O. KONNULLY MEM... St. Albert's Coll... Ernakulam-682... ...ch Centre & Postgradute D...

Page PAGE * MERGEFORMAT 2

VII. Attendance (one component in class participation):

95-100%	5
90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	Not eligible for appearing for ESE

VIII. Required reading:

- Erwin Kreyszig, Introductory Functional Analysis with applications, John Wiley and sons, New York
- Limaye, B.V, Functional Analysis, New Age International (P) LTD, New Delhi, 2004
- Simmons, G.F, Introduction to Topology and Modern Analysis, McGraw –Hill, New
- York, 1963
- Siddiqi, A.H, Functional Analysis with Applications, Tata McGraw –Hill, New
- Delhi, 1989
- Somasundaram. D, Functional Analysis, S.Viswanathan Pvt. Ltd, Madras, 1994
- Vasistha, A.R and Sharma I.N, Functional analysis, Krishnan Prakasan Media (P) Ltd,
- Meerut: 1995-96
- M. Thamban Nair, Functional Analysis, A First Course, Prentice – Hall of India Pvt.
- Ltd, 2008
- Walter Rudin, Functional Analysis, TMH Edition, 1974.

St. Albert's College (Autonomous)

~~MATSCRT02B~~ COMBINATORICS PMTHCRT02

Course Instructor

Name	Sem, Programme& Batch	Email
Jeema Jose	Sem IV MSc ,2018-19	jeemajose@alberts.edu.in

I. Duration of Course:

No	Activity	Duration
1	Contact hours	90(Including assignments)
2	Assessment (CAE & ESE)	6
	Total	**96**
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	**6**

Topics	Session No & Date(s)	Methodology and Duration
These are the topics to be covered in the modules		
Two basic counting principles, Permutations, Circular permutations, Combinations, The injection and bijection principles, Arrangements and selection with repetitions ,Distribution problems	14/11/2018 TO 25/11/2018	Class exercises Lectures Discussions Videos Illustration with examples
Introduction, The piegeonhole principle, More examples, Ramsey type problems and Ramsey numbers, Bounds for Ramsey numbers.	26/11/2018 TO 15/12/2018	Lectures, Discussions, Class exercises
Introduction, The principle, A generalization, Integer solutions and shortest routes Surjective mappings and Sterling numbers of the second kind, Derangements and a generalization, The Sieve of Eratosathenes and Euler ϕ -	16/12/ 2018 TO 18/01/2019	GD, Lectures, Class exercises, Presentations by students

St. Albert's College

function. (Chapter -4 Sections 4.1 to 4.7 of the text)		
Ordinary generating functions, Some modelling problems, Partitions of integer, Exponential generating functions Recurrence Relations Introduction, Two examples, Linear homogeneous recurrence relations, General linear recurrence relations, Two applications.	19/01/2018 TO 8/3/2019	GD, Lectures, Class exercises Visualisation of examples using GEOGEBRA

II.Course Objectives:

- To fill the gaps in modern problems of Discrete mathematics.
- To learn practical problem-solving skills, which can be later applied in algorithmic theory.
- To develop fundamental knowledge of **combinatorics** and complexity.
- To develop practical skills needed in modern logic.Generalization of concepts like continuity

II. Course Delivery Plan

The teaching methods include lectures, discussions, assignments, Seminars etc.

III. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time
Visualisation of pigeon hole principle using videos	1 Hour	Experiential Learning	8th Week
Illustrations with examples of theorems and concepts	5 Hours	Experiential learning	10th Week
Tower Of Hanoi with model	3 hrs	Experiential learning	12th week

IV. Assignments and Seminars

Assignments

No	Topics	Activity	Submission Deadlines	
Assignment	Assignment on given topic	Preparation of assignment	18th Nov 2018	Submit the assignment to before 21st Nov.
Seminar	PowerPoint presentation on given topic	PowerPoint Presentation for a presentation of 30 minutes duration	**13/01/2019 to 10/02/2019**	Submit the report before 11 th Jan

Note: Failure to submit the assignment on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.

St. Albert's College
Ernakulam-682018

V. Attendance (one component in class participation):

90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	**Not eligible for appearing for ESE**

VI. Required reading:

1. Chen Chuan -Chong, Koh Khee Meng, Principles and Techniques in Combinatorics, World Scientific,1999
2. V Krishnamoorthy, Combinatorics theory and applications, E. Hoewood, 1986

2. Hall,Jr, Combinatorial Theory, Wiley- Interscinice, 1998.

3. Brualdi, R A, Introductory Combinatorics, Prentice Hall,1992

St. Albert's College (Autonomous)

CODING THEORY

I. Course Instructor

Name	Sem, Programme & Batch	Email
Divya Mary Daise S	Sem 4, M.Sc. Mathematics, 2018-19	divyamary@alberts.edu.in

II. Duration of Course:

No	Activity	Duration
1	Contact hours	75
2	Assessment (CAE & ESE)	5
	Total	80
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	10

III. Course Objectives:

- To know how mathematics can be applied in rectifying the messages which are distorted while transmission through communication channel
- To learn about different types of codes used
- To familiarise the concepts of coding and decoding
- To study about BCH codes in a detailed manner
- To understand how the theory of finite fields is applied in coding and decoding

IV. Course Delivery Plan

Topics	Session No & Date(s)	Methodology and Duration
Topics	Session No & Date(s)	Methodology and Duration
These are the topics to be covered in the modules		
Module 1: Introduction Basic Definitions Weight, Maximum Likelihood decoding Synarome decoding, Perfect Codes, Hamming codes, Sphere packing bound, more general facts.	05-11-18 to 10-12-18	Lectures, Discussions, Assignments, Class exercises

St. Albert's College
Ernakulam-682018

Module 2: Self dual codes, The Golay codes, A double error correction BCH code and a field of 16 elements.	11-12-2018 to 10-01-2019	Lectures, Discussions, Assignments, Class exercises
Module 3: Finite fields	11-01-2019 to 31-01-2019	Lectures, Discussions, Assignments, Class exercises
Module 4: Cyclic Codes, BCH codes	01-02-2019 to 25-02-2019	Lectures, Student Presentations, Discussions

V. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time
Group Discussion and presentation of challenging exercises from the text book	5 Hour	Research Based Learning	5th Week onwards
Do a review of famous coding and decoding algorithms and make a group presentation - with practical applications (30 minutes)	2 Hours	Experiential Learning	8th Week Onwards

VI. Assignments and Seminars

No	Topics	Activity	Submission Deadlines	
Assignment 1	Assignment on given topic	Preparation of assignment	5th February 2018	Submit the assignment before 15th February 2018
Assignment 2	Assignment on given topic	Preparation of assignment	13th March 2018	Submit the assignment before 23rd March 2018

Note: Failure to upload the assignment to on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.

VII. Attendance (one component in class participation):

95-100% 5

[redacted]

4

3

80-85%	2	
75-80%	1	
<75		Not eligible for appearing for ESE

VIII. Required reading:

- Vera Pless 3rd Edition , Introduction to the theory of error coding codes. Wiley Inter Science
- R-Lidi, G. Pliz, Applied Abstract Algebra, Springer Verlag.
- J.H.Van Lint, Introduction to Coding Theory, Springer Verlag
- R.E.Blahut, Error- Control Codes, Addison Wesley.

St. Albert's College (Autonomous)

PMTAC8204 – MATHEMATICS FOR COMPUTING

I. Course Instructor

Name	Sem, Programme& Batch	Email
GOLDA MARY JOSEPH	Sem 4, M.Sc. Mathematics, 2018-19	goldamary@alberts.edu.in

II. Duration of Course:

No	Activity	Duration
1	Contact hours	75
2	Assessment (CAE & ESE)	8
3	Total	82
4	Remedial Sessions, Peer Tutoring, Tutorials (need based & Optional)	15

III. Course Objectives:

- Understand the basic concepts of object oriented programming
- Make use of tokens to write programs in C++
- Apply constructors, destructors and operator overloading in C++ programming
- Analyze inheritance in C++ programming
- Build formatted I/O operations
- Develop a document using Latex

IV. Course Delivery Plan

Topics	**Session No & Date(s)**	**Methodology and Duration**
Topics	Session No & Date(s)	Methodology and Duration
These are the topics to be covered in the modules		
Principles of Object Oriented Programming, Beginning with C++, Tokens, Expressions and Control Structures, Functions in C++	05-11-18 to 10-12-18	Class exercises Lectures
Classes and objects, Constructors and Destructors, Operator Overloading and Type Conversions	11-12-2018 to 10-01-2019	Class exercises Lectures

St. Albert's College
Ernakulam-682018

Inheritance, Extending classes, Managing console I/O operations	11-01-2019 to 31-01-2019	Class exercises Lectures
Introduction to LaTeX, Getting Started, Preparing as input file, changing the type style, Symbols from other languages, Mathematical formulas, Defining commands and environments, Other document classes-Books-Slides-Letter	01-02-2019 to 25-02-2019	Class exercises Lectures

V. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time
DISSERTATION TYPING USING LATEX	1 MONTH	Experimental Learning	2nd week of February
'SAMPLE GRADE CARD PRINTING' USING C++	1 DAY	Experimental Learning	1st week of February

VI. Practical Work

The following practical works needs to be done and submit the record book.

No	Topics	Activity	Submission Deadlines	
Practical Work	Assignment on given topic	Preparation of practical work	Programs 1-5: 5th December 2018 Programs 6- 10: 15th December 2018 Programs 11-15: 3rd January 2019 Programs 16-20: 13th January 2019 Programs 21-25: 8th February 2019	Submit the practical record book on or before the due date

Note:. Failure to submit the record on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.

St. Albert's College
Ernakulam-682018

VII. Attendance (one component in class participation):

95-100%	5
90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	Not eligible for appearing for ESE

VIII. Required reading:

1. E. Balagurusamy, Object Oriented Programming with C++, 4th Edition
2. Leslie Lamport, LaTeX: A document Preparation System, 2nd Edition
3. Stephen Prata, C++Primer Plus, 5th Edition
4. L. Lafore, Object Oriented Programming in C++, 4th Edition, Sams, 2011

St. Albert's College (Autonomous)

PMT4CRT05 – MATHEMATICAL ECONOMICS

I. Course Instructor

Name	Sem, Programme& Batch	Email
Dr. SABU M C	Sem 4, M.Sc. Mathematics, 2018-19	sabuchacko@alberts.edu.in

II. Duration of Course:

No	Activity	Duration
1	Contact hours	75
2	Assessment (CAE & ESE)	15
	Total	90
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	4

III. Course Objectives:

- Understand the basic concepts of Utility
- Explain the significance of Mathematical Modelling
- Make use of properties of Calculus
- Solve the problems related to Input – Output analysis
- Difference Equation
- Different Economical Models

IV. Course Delivery Plan

Topics	**Session No & Date(s)**	**Methodology and Duration**
Topics	Session No & Date(s)	Methodology and Duration
These are the topics to be covered in the modules		
The theory of Consumer Behaviour & Utility	05-11-18 to 06-12-18	Class exercises Lectures
The production function, Cobb Douglas production function	07-12-2018 to 08-01-2019	Class exercises Lectures

St. Albert's College Ernakulam-682018

The Input – Output Analysis, Leontief's Model	09-01-2019 to 06-02-2019	Class exercises, Lectures
Difference Equation, Harrod Model, Cobweb Model	07-02-2019 to 28-02-2019	Class exercises, Lectures

V. Assignments and Seminars

Assignments

The following Assignment needs to be submitted to Google Classroom. Both the assignments & presentation are individual assignments.

No	Topics	Activity	Submission Deadlines	
Assignment	Assignment on given topic	Preparation of assignment	Assignment 1 : 26th November 2018 Assignment 2 : 21st December February 2018 Assignment 3 : 28th January 2019	Submit the assignment book on or before the due date
Seminar	PowerPoint presentation on given topic	PowerPoint Presentation for a presentation of 10 - 15 minutes duration	January & February of Course	Submit the report 2 days before the seminar

Note: Failure to submit the assignment on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.

VI. Attendance (one component in class participation):

95-100%	5
90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	Not eligible for appearing for ESE

VII. Required reading:

1. **Singh S P, Anil K P, Singh H P, Economics and Mathematical Economics**
2. **Jean E Weber, Mathematical Economics**