LECTURER IN MATHEMATICS
(NCA NOTIFICATION)

COLLEGIATE EDUCATION
(CATEGORY No. 53/2015)

MATHEMATICS

History of Development of Mathematics.

Module-I

Mensuration, length of arcs, area of sectors of circles, tangents to circles, circumcircle and incircle of polygons, area of polygons, solids-volume and surface area.

Fundamentals of mumber theory. Continued fractions.

Boolean Algebra

Fundamentals of graph theory.

Module -II

Sets and binary operations, groups, Sylon's Theorems, Rings and ideals, Fields, extension fields, rings of polynomials, finite fields, Galois Theory, constructible numbers.

System of Linear Equations -
Vector spaces, linear transformations, characteristic values, characteristic polynomial, Minimal polynomial, Cayley-Hamilton theorem, triangulation and diagonalization of matrics.

Hyperspaces and linear functionals.

Module -III

Normed spaces, Banach spaces and related theorems, Linear Maps, inner product spaces, Hilbert spaces and related theorems, finite dimensional and infinite dimensional normed spaces, bounded operators, spectrum, duals and transposes. Adjoints, normal, unitary and self adjoint operators.
Polynomial Equations, Trigonometry, Analytical geometry of two dimension and three dimension, similarity of triangles, vectors, matrices.
Calculus, applications of differentiation and integration, elemetary functions (logarithms, exponential, hyperbolic, trigonometric etc), Fundamental theorem of calculus, mean value theorems, maxima and minima-functions of more than one independent variables, derivatives,

partial derivatives, saddle point, critical point.

Module -IV

Real numbers, rational, irrational numbers, algebraic and order properties of Real numbers, supremum property, countable and uncountable sets, completeness property, sequences and series of red numbers, relations and functions, limits and continuity of functions, uniform continuity, differentiability and integrability of functions, Riemann integral, Riemann-Stieltges integral, sequences and series of functions. Term by term differentiation and integration of series of functions.

Lebesgue measure, lebesgue integral, convergence theorems and applications

Module -V

Complex numbers, De Moirre's Theorem, Algebraic properties of complex numbers, regions in the complex plane.

Complex functions, analytic functions, harmonic functions, conformal mapping, elemetary functions, derivatives and integrals of complex functions and related theorems, sigularities, residue theorem and its applications, Power series, Taylor series, Laurent series.

Metric spaces, topological spaces, basis, subbasis, closed set, closure, interior, boundary, neighbourhood. Connectedness and compactness, locally connected, path connected, locally compact spaces.

Functions, continuous functions, homeomorphism, quotient space.

Seperation axioms and related theorems.

Module -VI

First order ordinary differential equations-formation, properties and various methods of solving.

Picards method of approximation.

Numerical methods

Second order ordinary differential equations – formaiton, properties and various methods of solving. Equidimensional equations.

Existence and uniqueness of solutions.

Systems of first order equations.

Series solutions of first order and second order ordinary differential equation at ordinary adn regular singular points.

Hypergeometric functions and equations, legendre equations and polynomials. Chebyshev's Equations and polynomials. Bessels equations and Functions.

Laplace transform, fourier series, beta and Gamma functions.

Formation and solution of first order partial differential equation in two independent variables. Functional dependence, analytic functions. Second order partial differential equation, formation, classification.

Wave equation, heat diffusion equation, laplace equation.

Numerical solutions of algebraic equations, finite differences, interpolation.

Module -VII

Fundamentals of Theory of Wavelets, Fuzzy set theory, Fractal geometry, Modular functions Jordan forms, elliptic functions, Riemann Zets Function, Automate and formal languages, Block Designs.

Monodromy theorem, Reimann mapping theorem, product topology and Tychnoff theorem.

Solutions at infinity of Differential Equations, Integral Equations, calculus of Variations.

Fundamentals of differential geometry, contractions, inverse function theorem, implicit function theorem.
Fundamentals of Mechanics and Fundamentals of Fluid Dynamics.

Module VIII
RESEARCH METHODOLOGY/TEACHING APTITUDE

I. TEACHING APTITUDE

- Teaching: Nature, objectives, characteristics and basic requirements;
- Learner's characteristics;
- Factors affecting teaching;
- Methods of teaching;
- Teaching aids;
- Evaluation systems.

II. RESEARCH APTITUDE

- Research: Meaning, Characteristics and types;
- Steps of research;
- Methods of research;
- Research Ethics;
- Paper, article, workshop, seminar, conference and symposium;
- Thesis writing: its characteristics and format.

Module IX (a)
Salient Features of Indian Constitution

Salient features of the Constitution - Preamble- Its significance and its place in the interpretation of the Constitution.

Fundamental Rights - Directive Principles of State Policy - Relation between Fundamental Rights and Directive Principles - Fundamental Duties.

Executive - Legislature - Judiciary - Both at Union and State Level. - Other Constitutional Authorities.

Centre-State Relations - Legislative - Administrative and Financial.

Services under the Union and the States.

Emergency Provisions.

Amendment Provisions of the Constitution.

Module IX (b)
Social Welfare Legislations and Programmes

Social Service Legislations like Right to Information Act, Prevention of atrocities against Women & Children, Food Security Act, Environmental Acts etc. and Social Welfare Programmes like Employment Guarantee Programme, Organ and Blood Donation etc.

Module X (a)
RENAISSANCE IN KERALA

TOWARDS A NEW SOCIETY

Introduction to English education - various missionary organisations and their functioning-founding of educational institutions, factories, printing press etc.

EFFORTS TO REFORM THE SOCIETY

(A) Socio-Religious reform Movements

SNDP Yogam, Nair Service Society, Yogakshema Sabha, Sadhu Jana Paripalana Sangham, Vaala Samudaya Parishkarani Sabha, Samathwa Samajam, Islam Dharma Paripalana Sangham, Prathyaksha Raksha Daiva Sabha, Sahodara Prasthanam etc.

(B) Struggles and Social Revolts

Upper cloth revolts.Channar agitation, Vaikom Sathyagraha, Guruvayoor Sathyagraha, Paliyam Sathyagraha. Kuttamkulam Sathyagraha, Temple Entry Proclamation, Temple Entry Act .Malyalee Memorial, Ezhava Memorial etc.

Malabar riots, Civil Disobedience Movement, Abstention movement etc.

ROLE OF PRESS IN RENAISSANCE

Malayalee, Swadeshabhimani, Vivekodayam, Mithavadi, Swaraj, Malayala Manorama, Bhashaposhini, Mathnubhoomi, Kerala Kaumudi, Samadarsi, Kesari, AI-Ameen, Prabhatham, Yukthivadi, etc

AWAKENING THROUGH LITERATURE

Novel, Drama, Poetry, *Purogamana Sahithya Prasthanam, Nataka Prashtanam,* Library movement etc

WOMEN AND SOCIAL CHANGE

Parvathi Nenmenimangalam, Arya Pallam, A V Kuttimalu Amma, Lalitha Prabhu.Akkamma Cheriyan, Anna Chandi, Lalithambika Antharjanam and others

LEADERS OF RENAISSANCE

Thycaud Ayya Vaikundar, Sree Narayana Guru, Ayyan Kali.Chattampi Swamikal, Brahmananda

Sivayogi, Vagbhadananda, Poikayil Yohannan(Kumara Guru) Dr Palpu, Palakkunnath Abraham Malpan, Mampuram Thangal, Sahodaran Ayyappan, Pandit K P Karuppan, Pampadi John Joseph, Mannathu Padmanabhan, V T Bhattathirippad, Vakkom Abdul Khadar Maulavi, Makthi Thangal, Blessed Elias Kuriakose Chaavra, Barrister G P Pillai, TK Madhavan, Moorkoth Kumaran, C. Krishnan, K P Kesava Menon, Dr.Ayyathan Gopalan, C V Kunjuraman, Kuroor Neelakantan Namboothiripad, Velukkutty Arayan, K P Vellon, P K Chathan Master, K Kelappan, P. Krishna Pillai, A K Gopalan, T R Krishnaswami Iyer, C Kesavan. Swami Ananda Theerthan , M C Joseph, Kuttippuzha Krishnapillai and others

LITERARY FIGURES

Kodungallur Kunhikkuttan Thampuran, KeralaVarma Valiyakoyi Thampuran, Kandathil Varghesc Mappila. Kumaran Asan, Vallathol Narayana Menon, Ulloor S Parameswara Iyer, G Sankara Kurup, Changampuzha Krishna Pillai, Chandu Menon, Vaikom Muhammad Basheer. Kesav Dev, Thakazhi Sivasankara Pillai, Ponkunnam Varky, S K Pottakkad and others

Module X (b)
GENERAL KNOWLEDGE AND CURRENT AFFAIRS
 General Knowledge and Current Affairs